SOUTHERN POWER AND INDUSTRY

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MARCH, 1952

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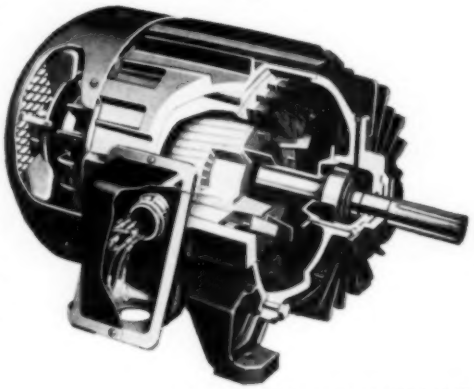
Totally-Enclosed
Fan-Cooled
MOTORS

Look Outside

Greatly increased radiating area means greater cooling efficiency. More important, cooling efficiency stays high, regardless of operating conditions. There are no enclosed external air passages to clog and cause overheating. If oily dirt sticks, just wipe or blow it off. No matter how bad operating conditions are, this motor can be easily kept clean and cool running. Electrical parts are protected against corrosive atmospheres by cast iron yokes and end housings.

Look Inside



Double-shielded, heavy-duty ball bearings require no maintenance in ordinary service under most conditions. However, they can be lubricated without disassembly if required. Double shielding prevents over-lubrication, leading cause of bearing trouble. Rotating seals, where shaft extends through housings, keep dirt and moisture out of bearing chambers. Die cast rotor and interphase insulation are further assurance of long life and low maintenance.

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HERE IS A MOTOR that is different from conventional TEFC motors; built with an entirely different cooling system that gives you big savings in lower maintenance, more continuous service and less trouble in the toughest locations. Clogging can easily be prevented in the Allis-Chalmers Type APZ TEFC motor since areas that might collect dirt are exposed and easy to clean.

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Volume 70 Number 3

Photomicrograph of one type of silica scale in early formation stage. Further deposits will fill in between the "trees" to form a dense, glass-hard, insulating covering that is extremely difficult to remove—and impervious to usual water treatment techniques.

STONE FOREST

(The boiler scale that fought back)

● When silica scale was mentioned, water-treatment experts used to change the subject quickly . . . until a plant using The Nalco System began having scaling troubles due to high silica content of the raw water.

That was many years ago. Today, the same plant, operating at 135 psi, maintains 500 ppm (29.4 grains per gallon) silica in boiler water without scaling.

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Whether your water treatment problem is silica—or something even tougher—Nalco has the solution, or can put the full facilities of the Nalco Laboratories to work on it for you.

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At operating pressures over 400 psi another silica problem—that of silica carry-over—often arises. One of the 1951 ASME papers, "Correlation of Silica Carry-over and Solubility Studies" is an up-to-the-minute, informative discussion of this problem. You are welcome to a copy. Just write to National Aluminate Corporation.

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SOUTHERN POWER AND INDUSTRY

MARCH 1952

Vol. 70 No. 3

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Facts and Trends

FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

March, 1952

► LARGEST PRIMARY ALUMINUM PRODUCER in the country will be the Kaiser Aluminum and Chemical Corporation's Chalmette, Louisiana operation, where two pot lines are already in operation. Two power plants will generate a total of 478,200 kw. The 2 pot lines now in operation are fed by 80 Nordberg radial gas engines (Check this issue for installational data). Power for the remaining 6 pot lines and plant services will be produced by a semi-outdoor design steam plant consisting of 15 steam generators and 16 turbo-generators.

► WANT TO CUT THAT FACTORY NOISE LEVEL? Chain hoists, steam lines, ducts, etc. often prohibit standard types of acoustical ceilings. However, check on Owens-Corning Fiberglas' noise-stop acoustical baffles. They are simply hung on wire, strung horizontally at any desired height.

► OLD CAST IRON PIPE CAN BE RENOVATED, even if the walls are worn away as much as one-third or the inside is rough and deeply pitted. One mining company unsuccessfully tried a wood lining, Bitumastic enamel, vitreous enamels, and rubber lining. However, they found that Johns-Manville Transite did the job. Old pipe is cleaned out, length of new Transite pipe inserted and cement grout is forced up between the old and the new pipe. Cement fills in the worn parts of the cast iron and seals the cast iron and Transite into one pipe unit. New pipe retains salvaged strength of the old metal and receives corrosion resistance and added strength of Transite.

► STATISTICAL QUALITY CONTROL can improve manufacturing and inspection efficiency, predict impending trouble in a process, and instill quality consciousness in the plant. Benefits from the technique ARE NOT CONFINED TO THE MASS PRODUCTION PLANT. A plant tested method for the small manufacturer is reported in this issue by C. Melvin Brooking, chief industrial engineer of the R. G. LeTourneau Longview, Texas, operation. Many systems collect data from 100-150 parts and then compute control limits for the process. LeTourneau's system is based on specifications — ideal for the small manufacturer.

► YOU CAN ROLL THE POWER, LIGHT AND HEAT to the maintenance job or temporary assembly line with National Electric Products Corporation's NE Rolla-Duct. The collapsible, fully portable device includes a power and light unit, strip of flood lighting, and strip of infrared heating units. Duct strip incorporates a circuit breaker for full worker protection. Units, carrying an approved rating for 20 amp loads for 115 or 120 volt operation, increase service area of permanent electric outlets to a radius of 20 ft or more.

► NEW CORROSION CONTROL FIELDS FOR PLASTICS — Dekoron plastic coating by Samuel Moore & Company is being used in ELECTRICAL WIRING RACEWAYS and as a CONVEYOR ROLLER COATING. Plastic coating of electrical metallic tubing and the galvanized finish of the EMT, gives double protection. Installational procedure is simple — tubing can be bent in same way as conventional EMT and no special wrenches are needed. Covering does not interfere with grounding continuity of raceway system. If corrosive conditions in your materials handling applications are severe enough to warrant use of stainless steel rollers, consider Dekoron coating. It can be applied over ordinary carbon steel rollers and render them impervious to effects of moisture, salt, acids, alkalis, etc. Only common solvents which effect coating are the chlorinated hydrocarbons (carbon tetrachloride and trichloroethylene) and to a lesser extent the aromatic and aliphatic hydrocarbons.

► NEW FLUORESCENT LIGHTING TECHNIQUE installed at the U. S. Department of Agriculture's Plant Industry Station at Beltsville, Md., involves the use of a system whose fluorescent lamps operate on 360 rather than the conventional 60 cycles. By operating lamps at a higher current than would be practical at 60 cycles, engineers have increased the amount of light available from the lamps by 40 per cent.

► WHAT ABOUT WAGES? What stabilization does, who administers it, who is covered, the Wage Stabilization Board's policy in general, various wage regulations, policy in cost-of-living increases, enforcement, and disputes cases procedure are all covered in a free booklet WAGES IN A NATIONAL EMERGENCY — THE WHY AND HOW OF WAGE STABILIZATION. Southern and Southwestern industrial and power plants can secure a complimentary copy from the following WSB Regional Offices: 21 East Broad St., RICHMOND, VA.; 78 Marietta St., N.W. Rhodes Bldg., ATLANTA, GA.; Grand Ave. Bank Bldg., 18th and Grand Ave., KANSAS CITY, MO.; and from 315 Wilson Bldg., DALLAS, TEXAS.

► DESCALING OF BAR STOCK is the newest application of INDUCTION HEAT. It used to be done mechanically and knocked off with brushes. Then came pickling and blast cleaning. International Harvester is now moving hot rolled bars 2-3 in. diameter, and 39 in. long (axle shafts) through the coil of a Tocco induction heating unit. Operation is on a production line basis. Surface temperature is raised to about 350 F. Scale expands and separates from base metal. Power Input: 65-75 kw; Speed: 900 ft/hr; Cost: Approximately $1 per 900 ft of bar stock.

► TRENDS IN CENTRIFUGAL FAN WHEEL BLADING — mechanical efficiency of airfoil blading — 92 per cent compared to 84 per cent for conventional bladed fans — has been demonstrated in Westinghouse's Sturtevant Division laboratory. Ordinarily, fan blades are simple rectangular metal plates, flat or curved, welded in the rotating element. In the airfoil blading, the blade cross-section is similar to that of an airplane wing cross-section — teardrop shaped and curved backwards from its direction of rotation.

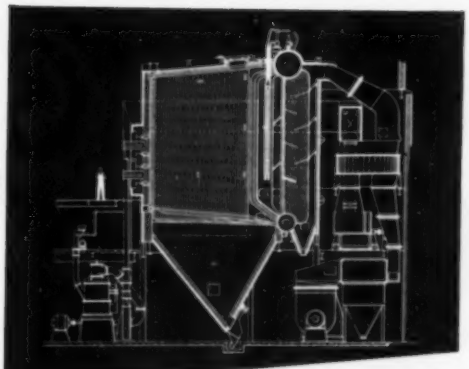
The airfoil blade exerts positive pressure on the air over its entire face from leading edge to the trailing edge. Air flow is smooth with a minimum of turbulence. They are more costly as each is a hollow steel shell with supporting struts welded longitudinally inside. However, higher efficiency makes construction worthwhile as savings in horsepower during the write-off life more than repay small premium in first cost.

► THE FUTURE LOOKS BLACK at Phillips Chemical Company in Bartlesville, Okla., but that is the way they want it. Phillips Petroleum Company, owner of Phillips Chemical, recently received the Chemical Engineering Achievement Award for development of high abrasion carbon black and major contributions to the development of cold rubber. Among previous achievements for which this award has been made have been the atomic bomb project, the wartime synthetic rubber industry, and the production of streptomycin.

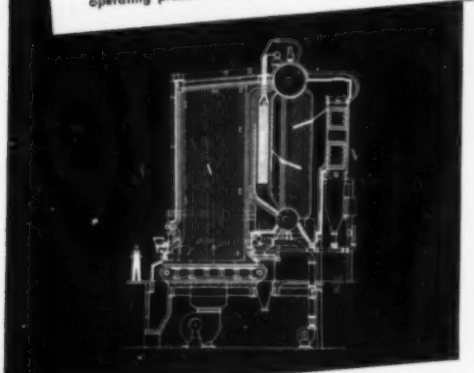
The story of carbon black — a major industrial product — was summarized at a Mid-Continent Regional Meeting of the ASME in Bartlesville by John A. Tallant of Phillips' chemical sales division. He reviewed the channel black production method (natural gas flames impinging on backs of steel channels), the continuous furnace method, a cyclic process (thermal decomposition of gas in checker fire brick furnaces), and Phillips own oil furnace black process.

First highly reinforcing carbon black ever made commercially from oil was produced by Phillips in 1943. This product — Philblack A — was ideal for mechanical synthetic rubber parts and tire carcasses. In 1947, Philblack O, an oil furnace black, was introduced. Superior in abrasion resistance to channel black, this new black was ideal for both synthetic and natural rubber tire treads. A still higher quality oil furnace black is now in the semi-commercial stage. Phillips predicts that eventually all, but a small percentage of the ccuntry's carbon plack production, will be of the oil furnace variety.

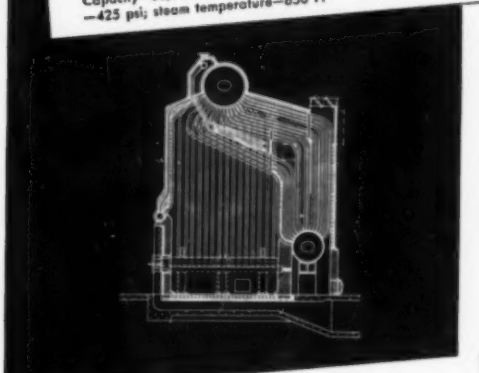
Write the editors for additional information on any of the above items.
SOUTHERN POWER & INDUSTRY 806 Peachtree St., N.E. Atlanta 5, Ga.



VU installation in a TEXTILE PLANT. This unit is fired with pulverized coal. Capacity—150,000 lb of steam per hour; operating pressure—600 psi; steam temperature—700 F.



VU installation in a TOBACCO PLANT. This unit is fired by a C-E Spreader Stoker (continuous discharge type). Capacity—90,000 lb of steam per hr; operating pressure—425 psi; steam temperature—650 F.



VU installation in an AUTOMOTIVE PLANT. This unit is fired with oil. Capacity—40,000 lb of steam per hour; operating pressure—150 psi.

How different are your steam requirements?

Every engineer knows that steam requirements vary from industry to industry . . . from plant to plant. It is virtually certain, therefore, that your particular conditions of fuel, load, capacity, pressure and temperature are not exactly the same as those of any other plant.

Yet the C-E Vertical-Unit Boiler can deliver top performance in your plant . . . just as it has done in hundreds of others . . . representing a wide variety of steam conditions.

This is because the basic design of the VU allows exceptional latitude in the selection of the *right* boiler to fit your particular requirements. It is available in capacities from 10,000 to 350,000 lb of steam per hr, with pressures from 160 to 1000 psi and temperatures up to 900 F, or more. It is adaptable to limited space conditions and to the use of any fuel or method of firing. The VU may be operated over a wide range of output, and, depending on fuels and the use of heat recovery equipment, efficiencies range up to 88%.

How well is the Vertical-Unit Boiler meeting the steam requirements of different industries? The answer is to be found in an impressive record of orders and repeat orders covering virtually every field. If you would like first hand information on the story of the VU Unit in *your* industry we would be glad to send it to you.

* * *

The point is that the story is the same . . . in industry after industry . . . *the popularity of the C-E Vertical Unit Boiler is widespread and steadily increasing.* Why not investigate how the variables of your requirements can be matched with the VU Unit for top performance?

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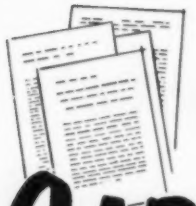

Service Reports Show that

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than ordinary V-type packings on rams, plungers and reciprocating rods

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Service reports, such as those at the right, prove that Chevron seals better, needs less maintenance, and lasts longer.

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THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

Typical CHEVRON Service Reports:

- Oil hydraulic presses packed with ordinary V-type packing. Due to oil seepage down ram special hoods had to be installed to protect operators. Installed all-synthetic rubber type Chevron alternated with Garlock Bitan V leathers. Result-rams are perfectly dry and protective hoods have been removed.
- Boiler feed pump in state institution. Operates average of 6 hours per day—365 days per year pumping water at 212-220 deg. F., 170 psi, discharge, 15 ft. head positive suction. Packed with Garlock 430 Chevron in 1942. Packing still operating efficiently.
- Reciprocating pumps in pipe line pumping stations. Pressures up to 700 psi. Stuffing boxes bushed to shallower depth as only four Chevron packing rings required to handle work performed previously by a much greater number of ordinary packing rings. Maintenance men very pleased with long life of Chevron packing and particularly lack of need for gland adjustment for changes of gravity in the crude oil being pumped.

GARLOCK PACKINGS, GASKETS, OIL SEALS, MECHANICAL SEALS

Popular Choice!

SPRINGFIELD TYPE C *Standardized* 2-Drum Boilers

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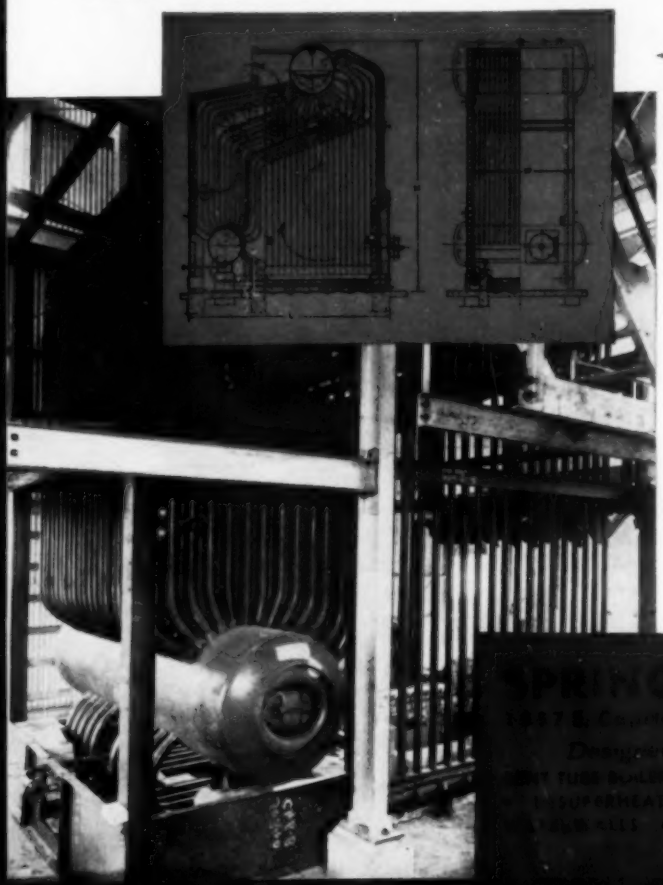

CEREAL MAKER—30,000 lb. Springfield Type C unit for America's largest manufacturer of cereals and grain food products. Oil and gas fired. *Location: Belmond, Iowa.*

LUMBER MILL—Two 65,000 lb. Springfield Type C units for large West Coast lumber company. Designed for firing with wood waste. *Location: Gardiner, Oregon.*

INSULATING MATERIALS—50,000 lb. Springfield Type C unit for insulation maker. Spreader stoker firing. Operating pressure, 250 psi. *Location: Dubuque, Iowa.*

BUILDING MATERIALS—30,000 lb. Springfield Type C unit for well-known maker of pressed sheathing and board. Gas and oil firing to 450 psi. *Location: Los Angeles, California.*

PLYWOOD PLANT—30,000 lb. Springfield Type C unit for western plywood mill. Designed for firing with wood waste. *Location: Portland, Oregon.*

STEEL MILL—35,000 lb. Springfield Type C unit for maker of steel forgings. Spreader stoker firing. Operating pressure 160 psi. *Location: Gary, Indiana.*

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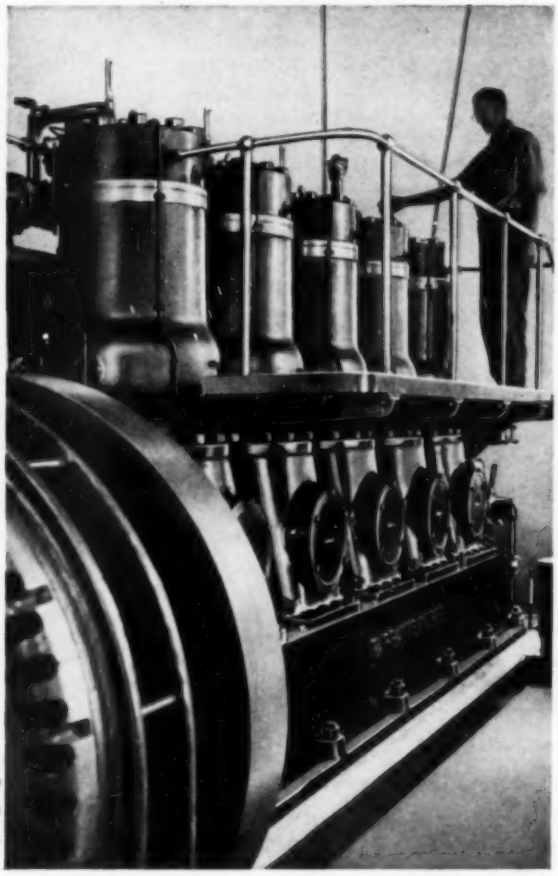
"Never Shut Down, Never Changed A Cylinder Liner!"

...CITY OF GRESHAM POWER AND LIGHT CO., WIS.

The City of Gresham Power & Light Company of Gresham, Wis. has two Fairbanks-Morse diesels and two hydro-electric units driven by water power. In the diesels, Mr. M. Fisher, Plant Superintendent, has been using Sinclair Gascon D. One of the engines has used this oil for 10 years.

Mr. Fisher reports that these diesels are running at high efficiency, and hardly ever need attention. He says, "We are getting ideal operation with no appreciable ring wear. We have never had a shutdown due to mechanical failure and have never changed a cylinder liner. I have a lot of confidence in this engine and in Gascon Oil."

Sinclair Gascon® Oil can save wear, trouble, and retard replacement in your diesels, too, as it has in scores of installations throughout the country. For more details of this fine lubricating oil, phone or write your local Sinclair Representative or write direct to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.



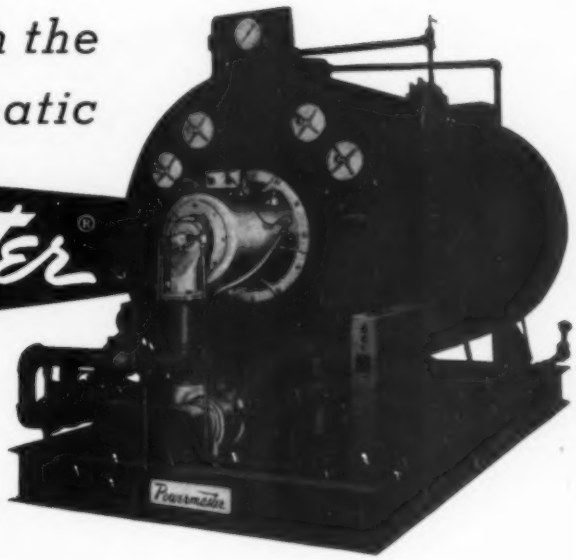
The 5 cyl. Fairbanks-Morse, 375 hp., 300 rpm. diesel of the City of Gresham Power & Light Co. plant. This runs 16 hours a day, needs little attention, thanks to Sinclair Gascon Oil.

Sinclair Diesel Lubricants

SAVE WEAR AND REPLACEMENT

now you can reduce steam costs with the automatic

Powermaster®



Model 3 *Powermaster* — 15 to 500 H.P.; high or low pressure models for steam or hot water.

Exclusive burner design (patent applied for) is yours with the *Powermaster* steam generator. Compare this unit with others and you'll see why users are saving hundreds of dollars on fuel bills. Only the *Powermaster* gives you these 3 definite ways to reduce your costs for steam or hot water—

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that added touch—

to the

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"LOCKHEAD" CLOSURE

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In this case, "that added touch" is the FW "Lockhead" closure which provides separate means for supporting the head pressure load and the gasket compression load.

Foster Wheeler feedwater installations include units capable of handling boiler feed flow in quantities up to and in excess of 1,000,000 lb per hr and design pressures up to 3,500 psi.

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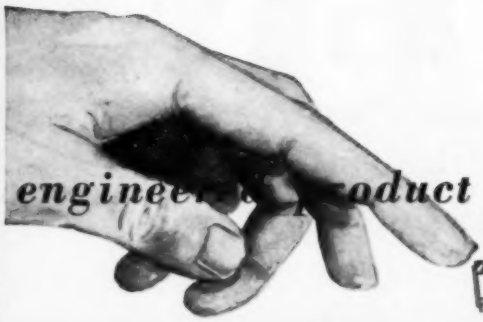

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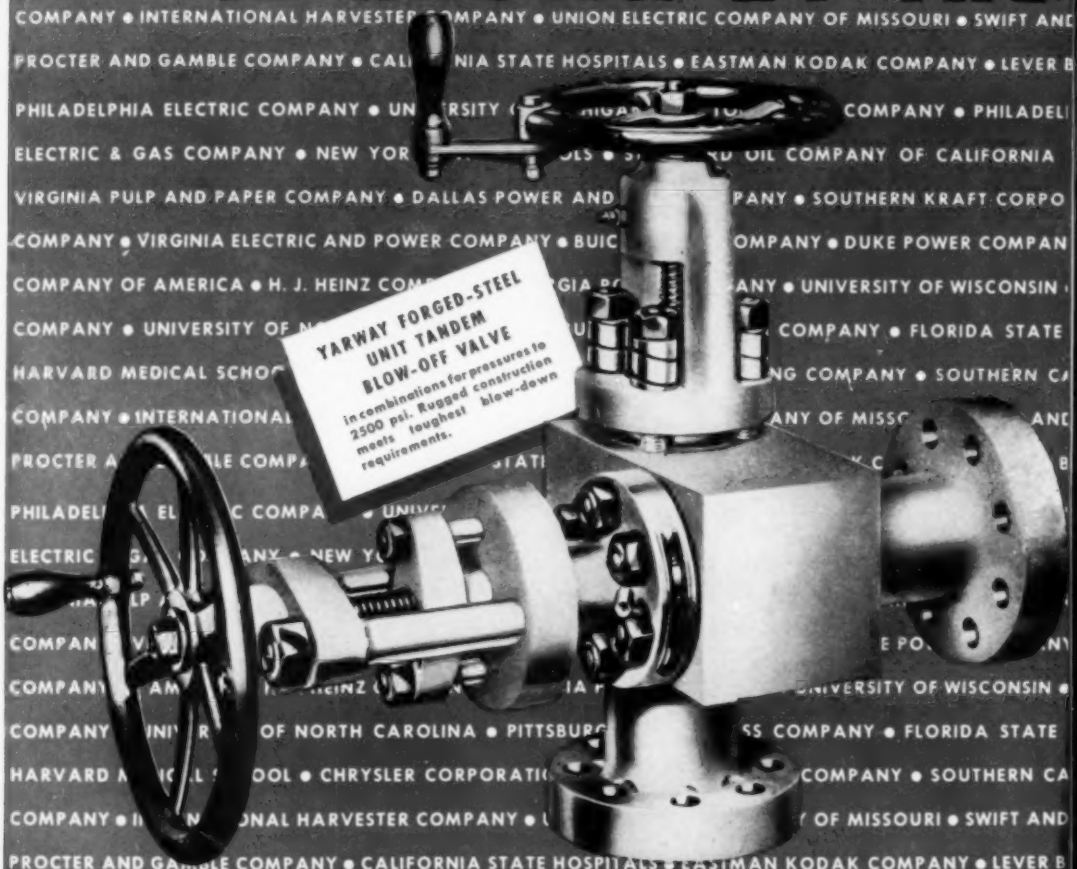
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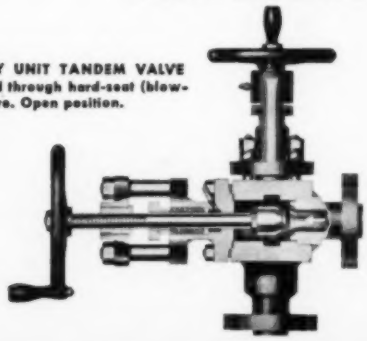
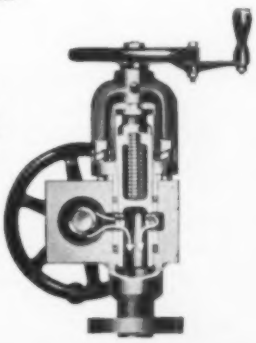
YARWAY UNIT TANDEM VALVE sectioned through hard-seat (blowing) valve. Open position.



YARWAY UNIT TANDEM VALVE sectioned through seatless (sealing) valve. Open position.



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Continued on page 140

3-53-3

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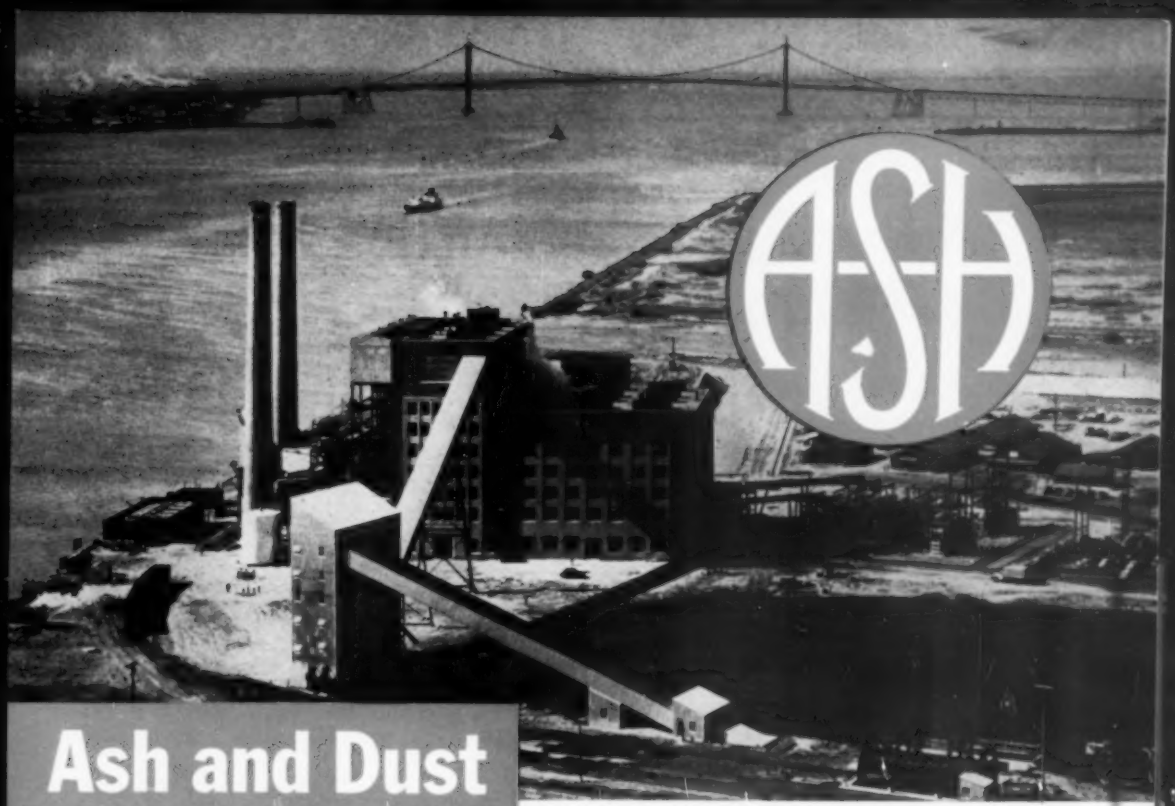

Delaware Power & Light Company's new Edge Moor Power Station near Wilmington, Delaware. In the background is the recently-dedicated Delaware Memorial Bridge.

Ash and Dust Handling at EDGE MOOR STATION

Hydrojet and Hydrovac Systems have been installed in the Delaware Power & Light Company's new Edge Moor Power Station to provide efficient handling of the ashes and dust. This 140,000-kw generating plant, located just outside Wilmington, Delaware, was recently put into full and regular operation.

The installation features two 600,000-lb-per-hr three-drum radiant-type steam generating units, having dry hopper bottoms with shaded ash pits. Bottom ash is sluiced from the flooded ash pits once every shift, and is then pumped to a settling and dewatering basin outside the plant. Fly ash from the mechanical dust collectors and from the bases of the 220-foot stacks is removed pneumatically by a push-button-controlled Hydrovac System.

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materials handling systems

A Statement by Anaconda on the Copper Situation

MANY users of copper have vital decisions to make . . . usually in connection with the present defense-induced shortages of copper and aluminum. This statement is an effort to remove the smoke screen surrounding the copper picture . . . to wipe away the confusion caused by too much talk supported by too few facts.

Substitution poses problems – Industry has been urged to substitute aluminum and other materials for copper. In some instances this may be logical and practicable. In many others it is difficult, if not impossible. But – before making *any* long-term decisions that may cost a great deal of money in engineering, new plant facilities or rescheduling of production operations – one should know the facts about the future of copper.

New Anaconda projects – The first major increase in copper production will come from Anaconda when the Greater Butte Project and the new Sulphide Plant at Chuquicamata, Chile, begin operations this spring. By 1953, these two projects should raise present levels of copper production by about 95,000 tons yearly.

Toward the close of 1953, Anaconda's new Yerington project in Nevada is expected to start producing at an annual rate of 30,000 tons. By then, Anaconda will be adding to the present yearly copper supply at the rate of about 125,000 tons.

Other new projects – During 1954-55 still other new projects in the U. S. and friendly foreign countries will further augment the increasing copper supply. All told, it is estimated that by 1955, not less than 450,000 tons of copper could be produced annually – over and above present production levels.

Accordingly, in 1955-56, domestic production plus imports could bring the U. S. copper supply to 1,800,000 tons yearly. This would represent an increase of about 20% over present levels. Based on historical comparisons, and barring a large-scale shooting war, this amount of copper could support a Federal Reserve Board Index of Industrial Production of 270, an increase of 24% over the present, and 45% above the first half of 1950.

• • •

These are the 'things to come' in copper. On the basis of the facts there is no necessity for considering long-range substitution of other materials for the red metal.

52320A

ANACONDA
COPPER MINING COMPANY

The American Brass Company
Anaconda Wire & Cable Company
International Smelting and Refining Company
Andes Copper Mining Company
Chile Copper Company
Greene Cananea Copper Company

PRODUCERS OF: Copper, Zinc, Lead, Silver, Gold, Cadmium, Vanadium, Superphosphate, Manganese Ore, Ferromanganese.
MANUFACTURERS OF: Electrical Wires and Cables, Copper, Brass, Bronze and other Copper Alloys in such forms as Sheet, Plate, Tube, Pipe, Rod, Wire, Forgings, Stampings, Extrusions, Flexible Metal Hose and Tubing.

POWELL VALVES
are engineered to suit
the service conditions
Therefore, when you install the correct Powell Valve in a line, you are assured of long, trouble-free performance under even the most exacting conditions.
And because there's a POWELL valve for every known industrial service, there are more different kinds of Powell Valves in use today than any other make.
The Wm. Powell Company
Cincinnati 22, Ohio
Fig. 1503 W. E. 150-pound Cast Steel O. S. & Y. Gate Valve with welding ends
POWELL
BRONZE, IRON, STEEL AND CORROSION-RESISTING VALVES

GULF E.P. LUBRICANTS

provide an *extra* margin of protection for gears and drives

When you switch to Gulf E. P. Lubricants for the lubrication of gears and drives throughout the plant, you take a positive step toward reduced maintenance costs. Specially compounded to withstand shock loads and high pressures in the toughest service, Gulf E. P. Lubricants are ideal for all types of gears, including spur, helical, bevel, spiral, worm, and hypoid gears.

Because of their greater lubricating value, you get this practical advantage—you can often eliminate one or more grades of gear lubricants. Take the case where two straight mineral oils, one having a viscosity of 75 S.U.V. @ 210°F. for slow speed spur and helical gears, the other having a viscosity of 150 S.U.V. @ 210°F. for worm gears are used. It is usually possible to replace these with one grade of Gulf E. P. Lubricant, the viscosity of which would be low enough for the spur gear application, while its higher lubricating value would make this product suitable for the worm gear drives.

Other advantages: nonfoaming—saves loss of lubricant and mopping up; tenacious—minimizes throwoff; extremely stable for this type of lubricant; help prevent rust; and they are just as suitable for the lubrication of all types of bearings.

Gulf E. P. Lubricants are available in the proper viscosity for every gear requirement, ranging from 55 to 1050 S.U.V. at 210°F. For specific recommendations for your equipment, call in a Gulf Lubrication Engineer today. Write, wire, or phone your nearest Gulf office. Gulf Oil Corporation · Gulf Refining Company, Pittsburgh 30, Pa.

GULF SERVES INDUSTRY

You've got a Winning Combination

A STANDARD ISA FACE-TO-FACE DIMENSIONS
K "FLOW LINE" CONTOURED BODY
Q STELLITED SEATING SURFACES
J RENEWABLE SELF-ALIGNING GUIDES
10 SEAT RINGS EASILY REPLACED WITH VALVE IN PIPE LINE

with the New TRADE LESLIE MARK

DOUBLE SEATED DIAPHRAGM CONTROL VALVES

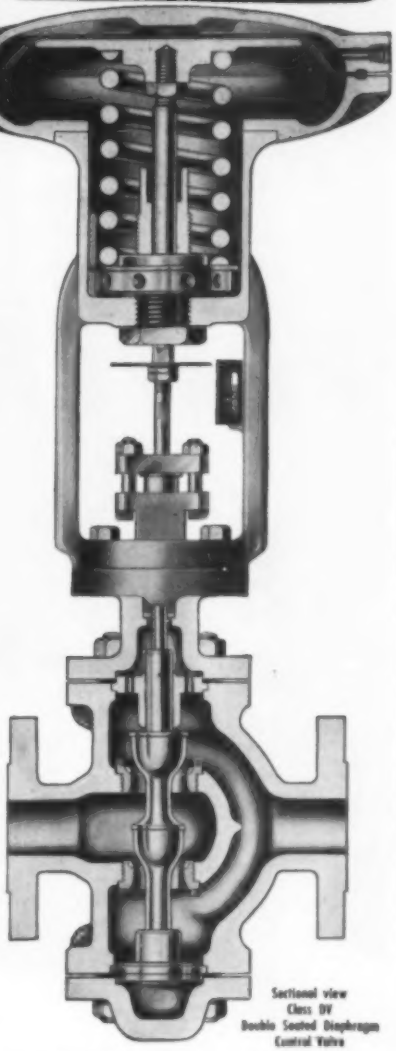
Calling a spade a spade you've got a "royal flush" of features in these new Valves designed for use with control instruments.

Their "Flow-Line" Contoured Bodies have ISA standard face-to-face dimensions and high capacity, low turbulence and minimum body pressure drop characteristics.

A new type, top and bottom guided construction is self-aligning and non-binding regardless of uneveness of bolt tightening.

Standard, integral stellited seating surfaces are recommended for steam service to reduce seat ring thread corrosion. Renewable, interchangeable seat rings also furnished where desired and may be easily replaced without removing valve body from the line. Elaborate grinding at high temperatures is completely eliminated.

With these Valves, you get as *standard equipment*, features heretofore only obtainable in expensive, specially designed valves.



Sectional view
Class DV
Double Seated Diaphragm
Control Valve

Look for LESLIE REGULATORS under "Valves" or "Regulators" in your classified telephone directory in the following cities where LESLIE factory trained engineers are located.

Albany, N. Y.	Chicago, Ill.	Galveston, Tex.	Memphis, Tenn.	Orlando, Fla.	Salt Lake City, Utah
Albuquerque, N. M.	Cincinnati, Ohio	Greenville, S. C.	Miami Springs, Fla.	Philadelphia, Pa.	San Francisco, Calif.
Atlanta, Ga.	Cleveland, Ohio	Houston, Texas	Milwaukee, Wis.	Pittsburgh, Pa.	Seattle, Wash.
Baltimore, Md.	Dallas, Texas	Indianapolis, Ind.	Minneapolis, Minn.	Ponca City, Okla.	St. Louis, Mo.
Beaumont, Tex.	Denver, Colo.	Kansas City, Mo.	Mobile, Ala.	Providence, R. I.	Syracuse, N. Y.
Birmingham, Ala.	Des Moines, Ia.	Kingsport, Tenn.	Monroe, La.	Richmond, Va.	Tucson, Ariz.
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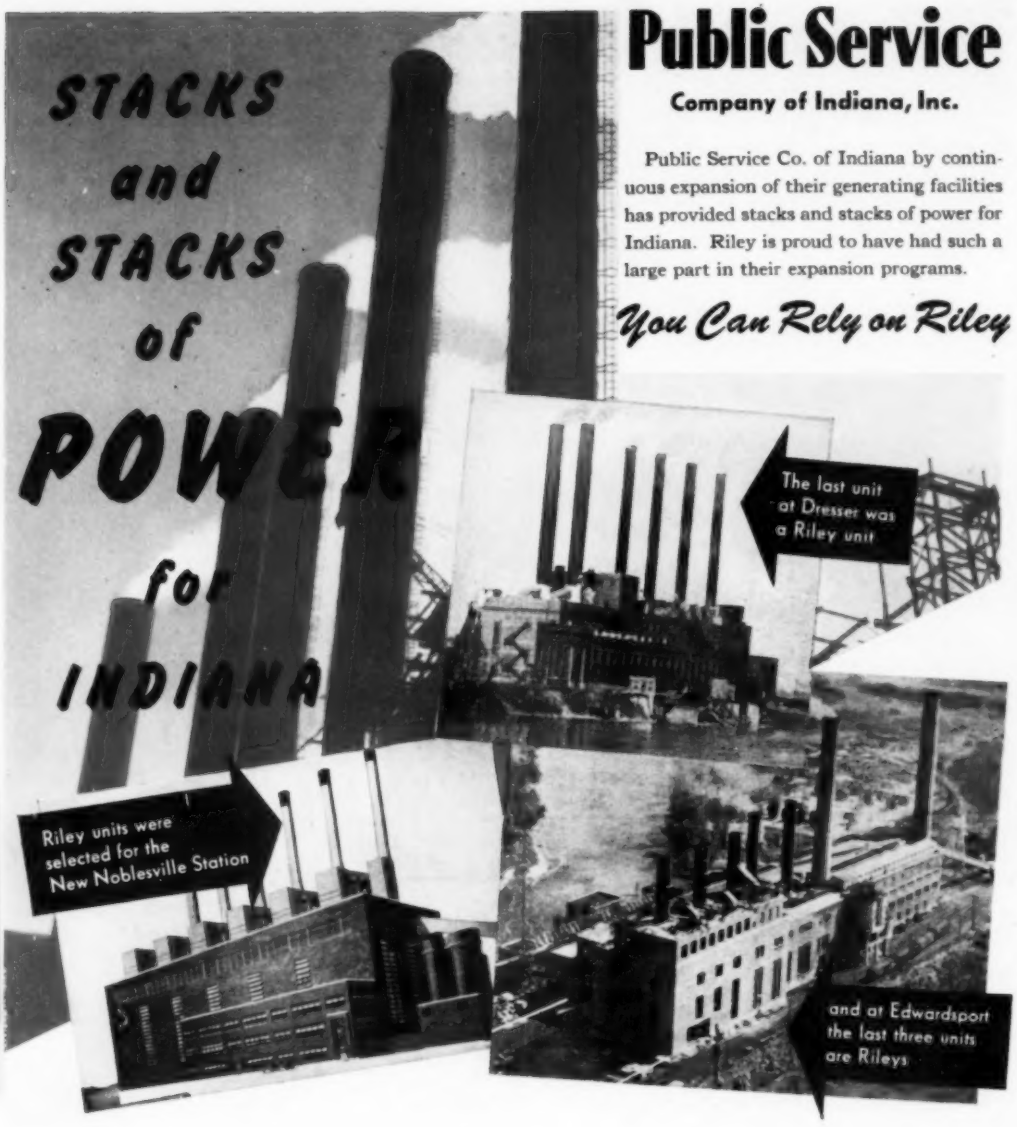
***WRITE FOR* Bulletin 513**

ESTABLISHED 1900
LESLIE CO.

261 Grant Avenue, Lyndhurst, New Jersey

FLOATLESS LEVEL CONTROLS • PRESSURE REDUCING VALVES • PRESSURE CONTROLLERS
SELF CLEANING STRAINERS • PUMP GOVERNORS • TEMPERATURE REGULATORS
• AIR HORNS • STEAM WHISTLES



Public Service

Company of Indiana, Inc.

Public Service Co. of Indiana by continuous expansion of their generating facilities has provided stacks and stacks of power for Indiana. Riley is proud to have had such a large part in their expansion programs.

You Can Rely on Riley

TRADE MARK Rx REGISTERED

RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston · New York · Philadelphia · Washington · Buffalo · Pittsburgh · Cleveland · Detroit · Chicago
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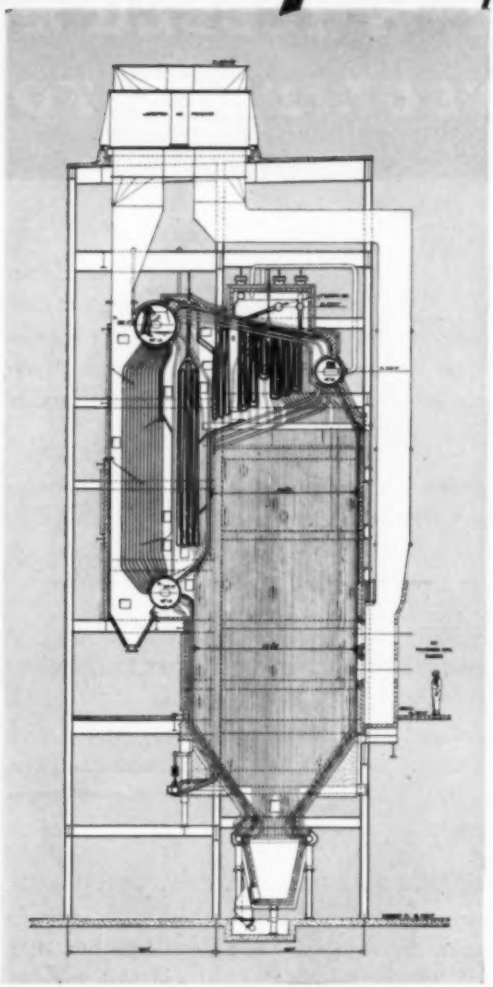
BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • FLUE GAS SCRUBBERS

Installed 7 Riley Units Since 1947



PUBLIC SERVICE COMPANY OF INDIANA
NOBLESVILLE STATION
3—300,000 lbs./hr. Riley Units
1025 psig—950°F. Temperature

Public Service Company of Indiana Selected Riley Steam Generating Units for their latest additions to Dresser and Edwardsport Stations and also for their new Noblesville Station. Sargent and Lundy were Consulting Engineers.

Riley History of Public Service Co. of Indiana

First Order—July-1946
1—300,000 lbs./hr. Riley Unit for Dresser Station

Second Order—Sept.-1946
2—400,000 lbs./hr. Riley Units for Edwardsport Station

Third Order—July-1947
3—300,000 lbs./hr. Riley Units for Noblesville Station

Fourth Order—March-1949
Another 400,000 lbs./hr. Riley Unit for Edwardsport Station

Total 4 orders—7 Units—Total Capacity 2,400,000 lbs./hr.

All of these Public Utilities have Purchased Riley Steam Generating Units.

Monongahela Power Co.
Houston Lighting & Power Co.
Iowa Electric Light & Power Co.
Utah Power & Light Co.
S. Carolina Elec. & Gas Co.
Union Electric Co. of Illinois
Southwestern Public Service Co.
New Orleans Public Service Co.
Gulf Power Co.
Florida Power & Light Co.
Ohio Edison Co.
Southern Ind. Gas & Elec. Co.
Interstate Power Co.
Upper Michigan Power & Light Co.
Central Ohio Light & Power Co.
Natrona Power & Light Co.
Cambridge Electric Light Co.
West. Colorado Power Co.
Newport Electric Co.
Northwestern Public Service Co.
S. Carolina Public Service Authority
The Potomac Edison Co.
Northern States Power Co.
Arkansas Power & Light Co.
Central Illinois Light Co.
Public Service of Indiana
Northern Virginia Power Co.
Carolina Power & Light Co.
Worcester County Electric Co.
Penn. Electric Co.
Iowa-Illinois Gas & Electric Co.
Mississippi Power Co.
Lynn Gas & Electric Co.
West Penn. Power Co.
Superior Water, Light & Power Co.
Ottertail Power Co.
Cliffs Power & Light Co.
Washington Water Power Co.
Iowa Public Service Co.
N. Dakota Power & Light Co.
Missouri Utilities Co.
City of Los Angeles Water & Power

It will pay you to consider Riley equipment because Riley gives you more for your money.

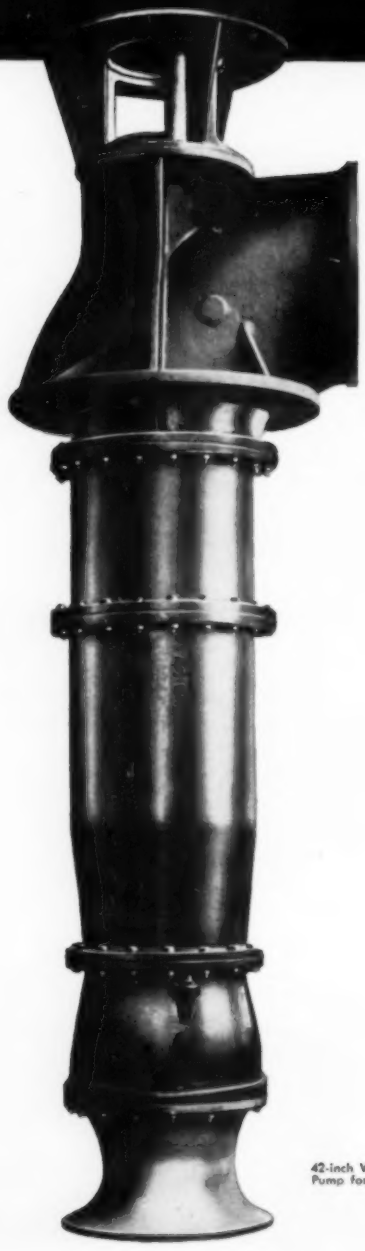
A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

C. H. WHEELER & *CONSOLIDATE TO*



42-inch Wheeler-Economy Vertical Mixed Flow Pump for condenser circulation. 32,500 G.P.M.

Economy Pumps, Inc. and C. H. Wheeler Manufacturing Company have consolidated engineering and manufacturing facilities in C. H. Wheeler's plant at Philadelphia. Facilities are now being expanded through new construction and the installation of additional modern machine tool equipment.

PUMPS . . . Economy has for many years been among the leaders in the engineering and manufacture of centrifugal, axial and mixed flow pumps. Today, the Wheeler-Economy line is one of the most modern and complete in the pumping industry.

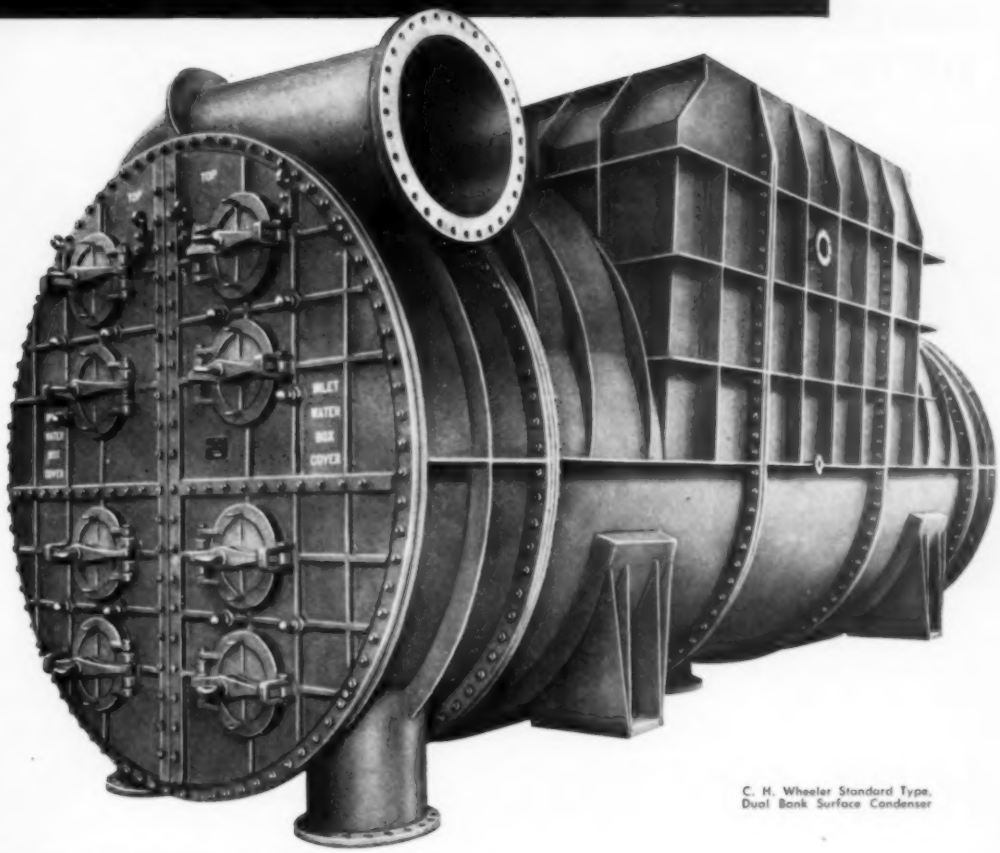
CONDENSERS & POWER PLANT EQUIPMENT . . . The C. H. Wheeler Manufacturing Company has contributed many of the outstanding developments in the field of condensing apparatus and vacuum problems. Nearly a decade ago, C. H. Wheeler adopted Economy mixed flow pumps for use with their condensers.

PROCESS EQUIPMENT . . . C. H. Wheeler is also internationally known for Cooling Towers, Steam Jet vacuum apparatus and Fine Particle Reduction Mills, vital links in modern chemical and food processes. Wheeler-Economy Pumps will round out the company's services in these fields.

MARINE GEAR . . . C. H. Wheeler's Marine Gear, Condenser and Deck Machinery department will be augmented by Wheeler-Economy Pumps designed for marine application.

ECONOMY PUMPS, Inc.

SERVE YOU BETTER . . .



C. H. Wheeler Standard Type,
Dual Bank Surface Condenser

WHEELER-ECONOMY PUMPS

. . . a new name combining old names that have been known and respected for generations. All the experience and metal working techniques this consolidation brings together are of great importance to you — our customer. Wheeler-Economy Pumps will fill your every requirement regardless of size or problem involved. Write to Philadelphia or to the nearest Economy or Wheeler representative listed in the phone directories of principal cities.

113-R

WHEELER-ECONOMY PUMPS

ECONOMY PUMPS, INC. • DIVISION OF C. H. WHEELER MANUFACTURING CO.
19TH AND LEHIGH, PHILADELPHIA 32, PA.

AT ROCKFORD

CENTRAL ILLINOIS ELECTRIC AND GAS CO.
Rockford, Illinois

It's Detroit Rotograte

Detroit RotoGrate Stoker ready for shipment to Sabrooke Station.

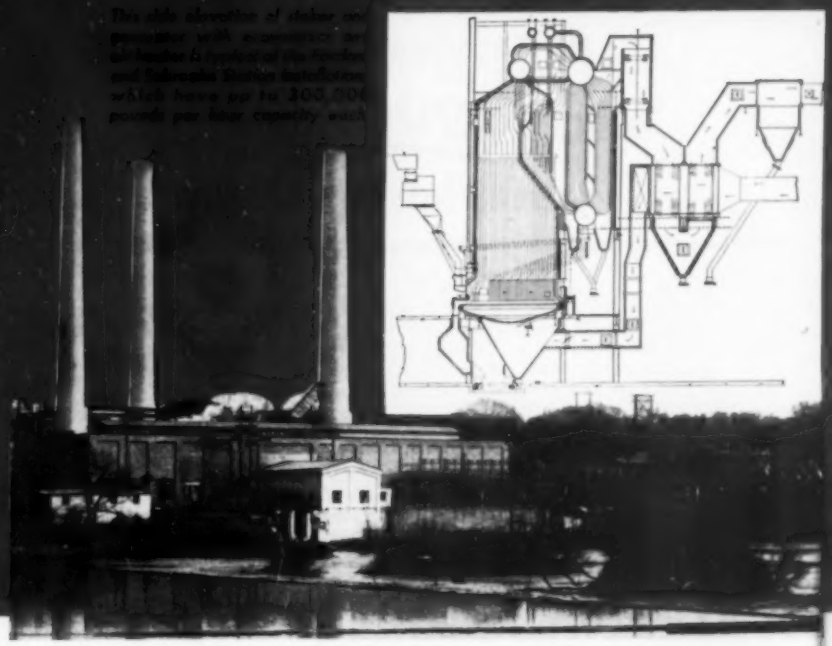
FOUR CONTRACTS FOR TWO STATIONS

Stone & Webster Engineering Corporation
Engineers and Constructors

960,000 Pounds of Steam per Hour total Capacity

Write for complete information on Detr

EXTENDING FORDAM STATION



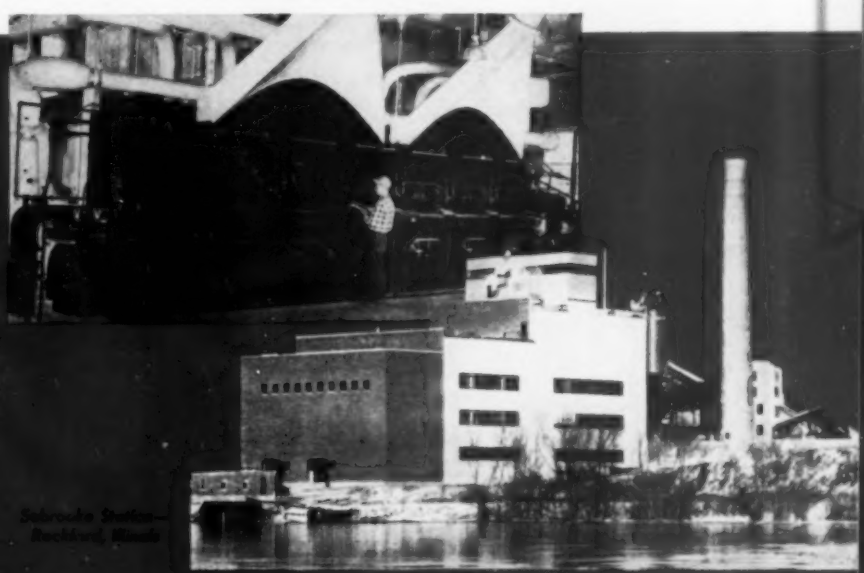
Fordam Station
Rockford, Illinois

Detroit RotoGrate Stokers were selected for the new boilers in the Fordam and Sabrooke Stations at Rockford:

FIRST because they efficiently burn any type of bituminous coal. SECOND because of the lower investment necessary in equipment, foundations and building. THIRD because of lower power consumption to operate both stokers and auxiliaries and lower maintenance with a minimum of slagging difficulties in the furnace.

RotoGrate Stokers are modern spreader stokers with grates that move slowly forward, discharging the ash at the front. They permit high burning rates to produce more capacity per foot of furnace width.

At Rockford, as well as hundreds of other plants, they are operating at highest efficiency—with greatest satisfaction.



Interior of Sabrooke Station shows number one unit.

NEW SABROOKE STATION

Sabrooke Station—
Rockford, Illinois

DETROIT STOKERS

DETROIT STOKER COMPANY

General Motors Building—Detroit 2, Michigan
District Offices in Principal Cities • Works at Monroe, Michigan

pennsylvania company solves TOUGH water hose problems

Splattering food juices in a large Pennsylvania Cannery quickly deteriorated ordinary washdown hose. The hose covers turned flabby and scraped off on concrete floors. The exposed carcasses wore out prematurely with the destruction accelerated when workmen kinked the hose to control flow All this cost time and money.

Could the problems be solved?

Republic's local Distributor thought so, and suggested a test run with Republic's Fairway Water Hose... no custom-built hose necessary.

That test, begun 15 years ago, is still going on because the **hose never wore out!!!** The workmen are more efficient with the easy-handling Fairway Hose, and the company (now a confirmed Republic customer) is tickled to death since eliminating hose repair and replacement costs

Fairway Hose, available in all standard sizes in 50 ft., 100 ft. or long production lengths on reels or in bales, is just one of the many Republic Rubber Products designed for rugged duty in your plant.

For a free analysis of your requirements, simply mail your request to Republic Rubber Division, Youngstown, Ohio.

INDUSTRIAL RUBBER PRODUCTS BY
REPUBLIC RUBBER DIVISION
Lee Rubber & Tire Corporation
YOUNGSTOWN, OHIO

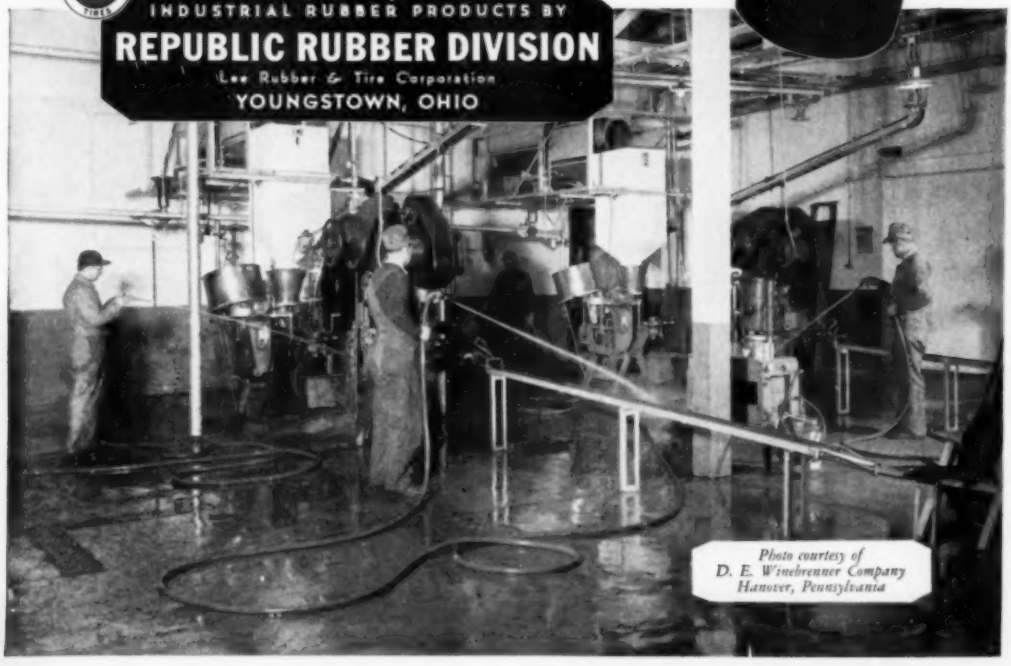
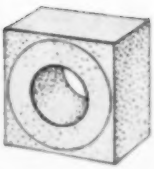


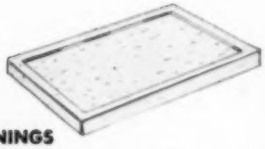
Photo courtesy of D. E. Winebrenner Company Hanover, Pennsylvania

There's no end to the uses of economical
B&W KAOCAST



BURNER BLOCKS

Kaocast lasted 3 to 6 times as long as previous refractory. Still going strong.

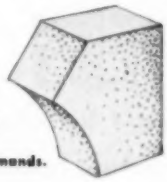


DOOR LININGS

Kaocast lasted 3 to 6 times as long as previous refractory—cut installation cost in half.

TUNNEL KILN CAR TOPS

Ordinary fireclay crumbled after few trips. Kaocast lasted 30 trips without deterioration.



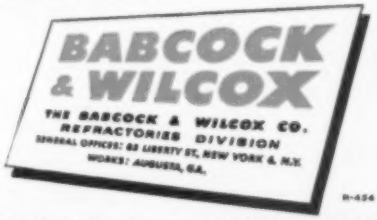
SPECIAL SHAPES

Kaocast special shapes cast over week-end to meet production demands.

BOILER FURNACE REPAIRS

One power plant keeps a ton of Kaocast on hand for miscellaneous repairs because it is so versatile.

The list of plants who are discovering new, cost-saving uses of versatile B&W Kaocast keeps growing all the time. The reasons? This unique 3000 degree refractory castable can be molded in a hurry . . . cast directly in place . . . applied with a cement gun. It eliminates the need for a large inventory of special shapes. It has high resistance to spalling, low volume change, practically no reheat shrinkage. Want to know more? Ask your B&W Refractories Engineer—or write for Bulletin R-22.



R-454

B&W REFRACTORIES PRODUCTS — B&W Allmul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick B&W Refractory Castables, Plastics and Mortars • OTHER B&W PRODUCTS—Stationary & Marine Boilers and Component Equipment . . . Chemical Recovery Units . . . Seamless & Welded Tubes . . . Pulverizers . . . Fuel Burning Equipment . . . Pressure Vessels . . . Alloy Castings

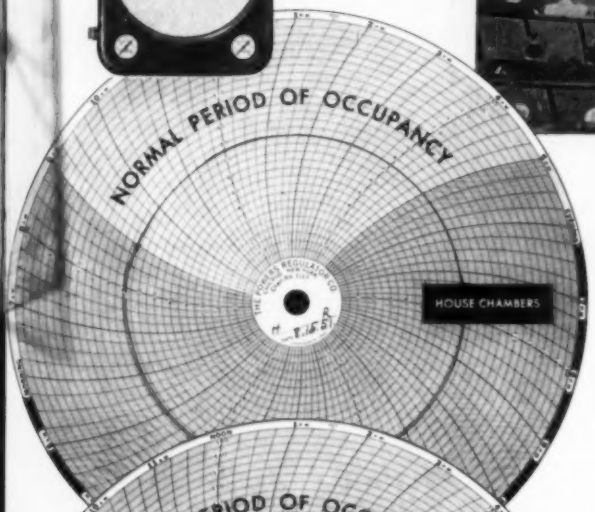
Uses **POWERS** System of

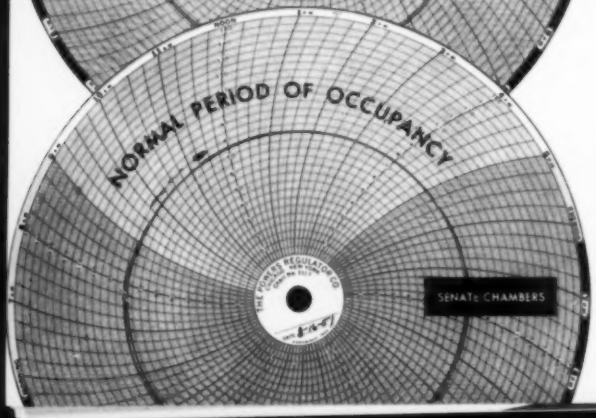
AIR CONDITIONING CONTROL

Right: Joint session of the Congress in the recently remodeled House of Representatives—listening to "State of the Union" address by the President.

In the historic House and Senate Chambers as well as the administrative offices in the Capitol, heating and air conditioning systems are regulated by a Powers system of pneumatic control.

Only a few of the many types of Powers Control used in the Capitol are shown here.
Left: Powers Two-pen Recording Controller.





World's Largest and Most Comfortable Legislative Hall is Regulated by—

POWERS AIR CONDITIONING CONTROL

◀ Note Accurate Control in House and Senate Chambers

Outdoor temperatures, during the period covered by the temperature charts varied between 75 and 95° F., yet indoor temperature was maintained constant from 9 A. M. to 5 P. M. One temperature sensitive bulb is located near the speaker's rostrum, another is in the gallery. Note separate lines during the off period of control and how the two lines merge into one when Chambers were occupied.

THE POWERS REGULATOR CO.

3400 OAKTON ST., SKOKIE, ILLINOIS • Offices in Over 50 Cities

Chicago 13, Ill., 3819 N. Ashland Ave. • New York 17, N. Y., 231 E. 46th Street
Los Angeles 5, Cal., 1808 West 8th Street • Toronto, Ontario, 195 Spadina Ave.
Mexico, D. F., Apartado 63 Bis. • Honolulu 3, H. I., P. O. 2755—430 Piikoi at Kona

Over 60 Years of Automatic Temperature and Humidity Control

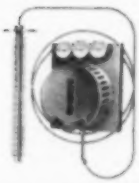
142 Spring St. N.W., Atlanta, Ga.

Other Washington Buildings using POWERS Control

Department of Agriculture and Post Office Department Bldgs., Department of Interior and Old House of Representatives Office Bldgs., Social Security R. R. Retirement Bldg., Apex Bldg., Lafayette Bldg., U. S. Navy Hydrographic Bldg., Washington National Airport.

Experience gained by Powers in supplying dependable temperature and humidity regulation for these buildings may be helpful to you. When your problems involve precise control for heating or air conditioning, contact Powers nearest office . . . in over 50 cities.

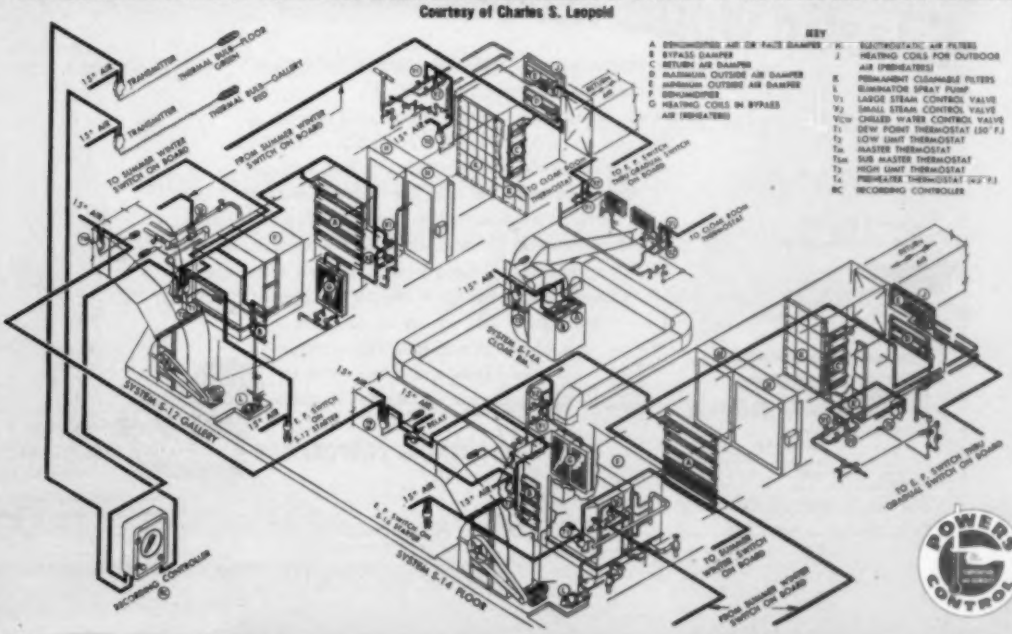
Powers Room Type Thermostat



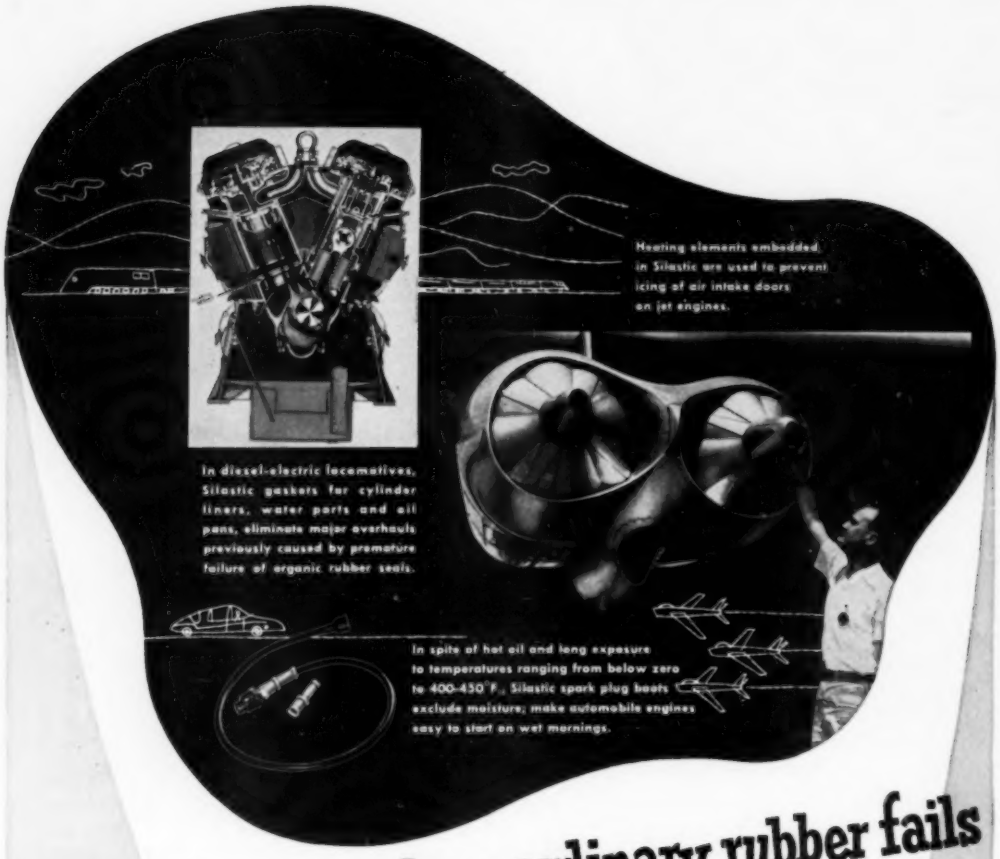
Powers Remote Bulb Thermostats for Dew Point, Low and High Limit, Preheater, Master and Sub-Master Control —only a few of the many controls used in the Capitol.

AIR CONDITIONING APPARATUS DIAGRAM FOR OPERATION AND MAINTENANCE OF SYSTEMS IN THE HOUSE AND SENATE CHAMBERS

Courtesy of Charles S. Leopold


KEY
A DEHUMIDIFIER AND DX FACE DAMPER
B BYPASS DAMPER
C RETURN AIR DAMPER
D MAXIMUM OUTSIDE AIR DAMPER
E MINIMUM OUTSIDE AIR DAMPER
F DEHUMIDIFIER
G HEATING COILS IN BYPASS AIR (REHEATERS)
K ELECTROSTATIC AIR FILTERS
J HEATING COILS FOR OUTDOOR AIR (PREHEATERS)
E PERMANENT CLEANABLE FILTERS
L ELIMINATOR SPRAY PUMP
V1 LARGE STEAM CONTROL VALVE
V2 SMALL STEAM CONTROL VALVE
VCW CHILLED WATER CONTROL VALVE
T1 DEW POINT THERMOSTAT (50° F.)
T2 LOW LIMIT THERMOSTAT
TM MASTER THERMOSTAT
TSM SUB MASTER THERMOSTAT
T3 HIGH LIMIT THERMOSTAT
T4 PREHEATER THERMOSTAT (42° F.)
RC RECORDING CONTROLLER
TRANSMITTER
THERMAL BULB—FLOOR GRATE
THERMAL BULB—GALLERY ROD
FROM SUMMER WINTER SWITCH ON BOARD
TO SUMMER WINTER SWITCH ON BOARD
TO CLOSE ROOM THERMOSTAT
10 F. F. SWITCH MIN. DAMPER SWITCH ON BOARD
SYSTEM S-14A CLOSE RM.
SYSTEM S-13 GALLERY
SYSTEM S-14 ROOM
RECORDING CONTROLLER
POWERS CONTROL

(a73)


Heating elements embedded in Silastic are used to prevent icing of air intake doors on jet engines.
In diesel-electric locomotives, Silastic gaskets for cylinder liners, water ports and oil pans, eliminate major overhauls previously caused by premature failure of organic rubber seals.
In spite of hot oil and long exposure to temperatures ranging from below zero to 400-450° F., Silastic spark plug boots exclude moisture, make automobile engines easy to start on wet mornings.

Silastic* works where ordinary rubber fails

At temperatures from −100° to over 500° F.,
in contact with hot oil at 350-400° F.,
in spite of weather, corona, shock and vibration,
you can count on Silastic to maintain a tight seal
or to confine electricity at high or low voltages.
That's proved by the fact that Silastic is used
to insulate traction motors, Navy control cable and
ignition cable for aircraft and ordnance vehicles.
It's used to seal heating and deicing systems,
bomb bay doors, limit control switches
and rocker box covers on aircraft;
sole plates in domestic steam irons;
cylinder liners and water ports in
diesel-electric locomotive engines.

For more information, mail this coupon today.

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Dept. No. BJ-15, Midland, Michigan
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☐ List of Silastic Fabricators
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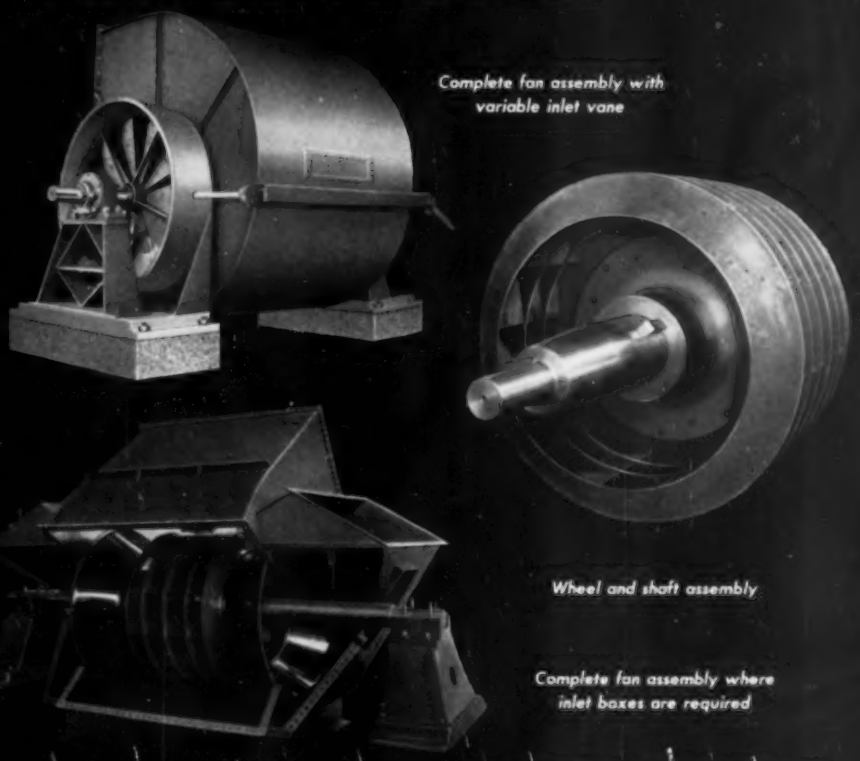
*T.M. Reg. U.S. Pat. Off.

American Blower . . . a time-honored name in air handling



Complete fan assembly with variable inlet vane

Wheel and shaft assembly

Complete fan assembly where inlet boxes are required

AMERICAN HS FORCED DRAFT FAN

Memo to Power Plant Men —

You'll get high efficiency without entry loss and turbulence at a substantial power saving with non-overloading American Blower HS Fans for forced draft duty in your power plant.

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary corporation

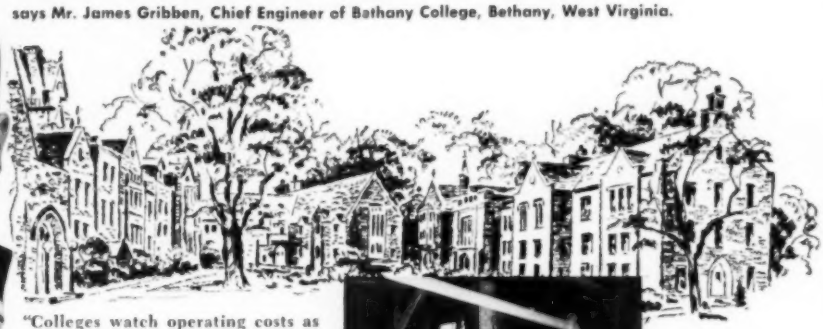
Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • ACME CABINETS • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

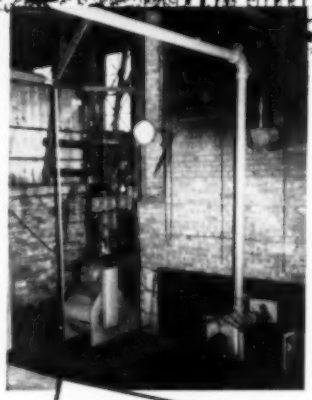
"We 'educated' our College Heating Plant...

with a modern coal installation we saved more than a third of our fuel bill,"

says Mr. James Gribben, Chief Engineer of Bethany College, Bethany, West Virginia.



"Colleges watch operating costs as closely as any business firm—and one big item for our college is the heating bill. That's exactly why Bethany went to the expense of putting in new coal heating equipment! Our old system supplied heat for sixteen buildings—to the tune of 2,600 tons of coal a year. Our new installation, with its automatic stoker, does the same job using only 1,650 tons. That's a fuel saving of 38.9%! Our eyes certainly have been opened to the efficiency and economy of *bituminous* coal—especially when it's burned with modern equipment."



Here's Bethany's new boiler room, showing the pipe of the automatic stoker. **THIS MODERN EQUIPMENT WILL PAY FOR ITSELF, THROUGH FUEL SAVINGS ALONE, IN LESS THAN TWO YEARS!**

Modern combustion installations can add anywhere from 10% to 40% to the energy obtained from the same amount of coal in years gone by. Great advances have been made in coal- and ash-handling equipment, too—cutting labor costs—making coal as clean and convenient to use as any fuel.

If you're planning to modernize your present installation—or thinking of building a new plant, call in a competent consulting engineer. He'll show you how a modern coal system designed to meet your specific needs can save you money and serve you better!

And don't forget—you'll always be able to get the coal you need. America's coal industry is the most efficient in the world. America's coal reserves are ample for centuries to come. Right now and for the future, too, coal users can be assured of a dependable fuel supply at reasonable prices.

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association
Washington, D. C.

If you're running your own steam plant—for heat or for power—you just can't afford to ignore these facts!

COAL in most places is today's most economical fuel.

COAL resources in America are adequate for all needs—for hundreds of years to come.

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

FOR HIGH EFFICIENCY — FOR LOW COST

YOU CAN COUNT ON COAL!

Versatile?

That's FARRELL-CHEEK

FOUR decades of broad experience in the field of producing the finest of highly diversified steel castings has given Farrell-Cheek a wide reputation for versatility. The skills and experiences which have come with forty years of diligent experimentation, research, and development, make Farrell-Cheek the logical source for long-wearing, extremely durable cast steel parts . . . standard or special design . . . either new, or for replacement.

Farrell-Cheek parts are made from carefully selected special steels. Farrell's Carbon Steels, Farrell's "85", and Farrell's Hard Edge, have all been developed for specific qualities which will give parts maximum strength and resistance to wear. Hard Edge has an affinity for depth penetration which can be controlled from 1/8" to 1/4" and permits great durability to be combined with fine machining properties. Farrell's "85", made in either carbon, vanadium, copper, nickel, or chrome combinations with manganese-molybdenum, can be hardened and toughened throughout, and provides superb qualities of toughness, rigidity, and wear resistance.

The fine physical properties of Farrell's cast steels, combined with a wealth of experience in the design and production of a tremendous variety of small to medium castings, makes the Farrell-Cheek name your choice for the procurement of your needs...the one source for the best... with the experience and ability to give you what you want.

FARRELL-CHEEK STEEL CO.

MANUFACTURERS OF HIGHEST QUALITY ELECTRIC FURNACE CARBON AND ALLOY STEEL CASTINGS

FARRELL'S CARBON STEEL CASTINGS
FARRELL'S HARD EDGE STEEL CASTINGS
FARRELL'S "85" STEEL CASTINGS

RAILROAD CASTINGS
Locomotive and Car
R. R. Specialty Castings.

ELEVATOR, CONVEYOR PARTS
Sprockets, Traction Wheels, Chains, Buckets, Rollers, Idlers.

BUSHINGS
Carbon and Alloy Steels Machined, Hardened, Ground.

CRANE WHEELS
Overhead, Gantry, Monorail, Ingot Car, Charging Machine.

GEARS AND PINIONS
"True Tooth" Gears and Pinions, Sheaves and Wheels.

SPECIALIZED CASTINGS
Light Section Castings

STOKER PARTS
Feed Screws, Furnace Tools, Flanged Pipe, etc.

HEAVY HARDWARE
Wire Rope Fittings, Choker Hooks, Bar Benders, Cutters.

SANDUSKY, OHIO U.S.A.

YOUR INQUIRY WILL PROMPTLY BRING DETAILED INFORMATION PERTAINING TO ANY OF THE ABOVE FARRELL-CHEEK PRODUCTS

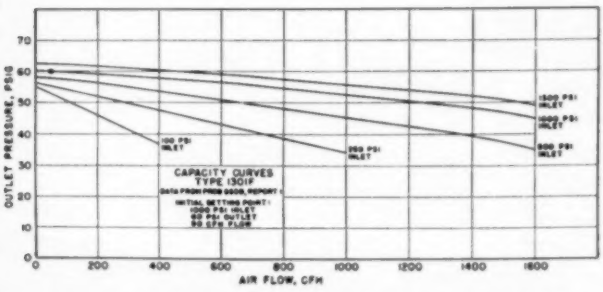
HIGH PRESSURE REDUCING VALVE for AIR or GAS SERVICE

INLET PRESSURE UP TO 3000 PSI
OUTLET PRESSURE 10 TO 150 PSI

Type 1301F is commonly used in conjunction with pilot operated controllers where high pressure operating medium is used. They are also used in general industrial applications for high pressure reduction of non-corrosive air or gas.

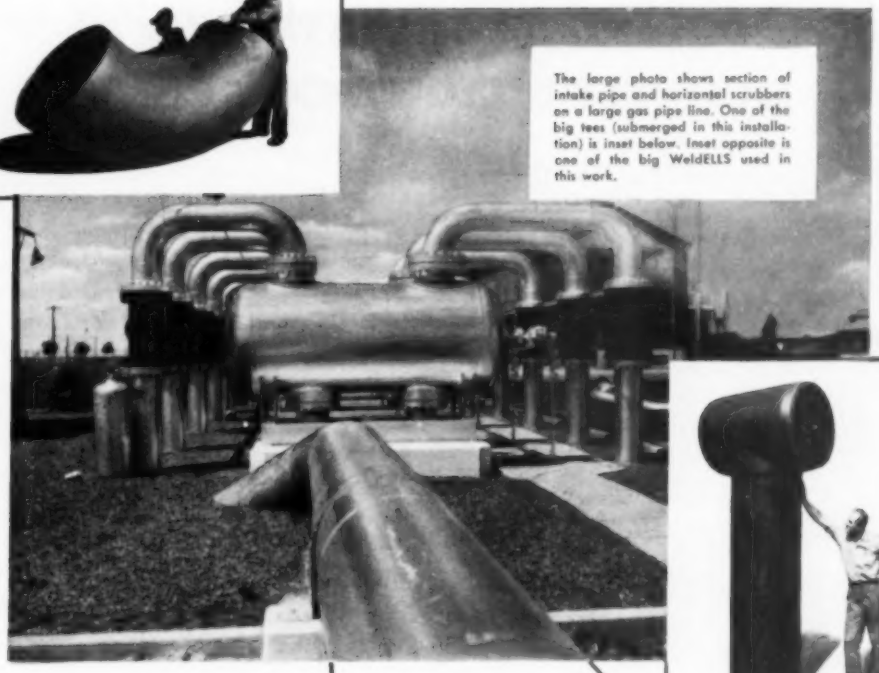
CONSTRUCTION:
All forged bronze construction with glass impregnated Teflon valve disc, stainless steel orifice. Furnished with one inlet connection and two outlet connections of ¼" pipe size.

PRESSURE RANGE:
Suitable for inlet pressures up to 3000 PSI; reduced pressure spring ranges of 10 to 75 PSI; 50 to 150 PSI. Adjustment screw for easy adjustment of reduced pressure setting.



FISHER GOVERNOR COMPANY
Marshalltown, Iowa

The large photo shows section of intake pipe and horizontal scrubbers on a large gas pipe line. One of the big tees (submerged in this installation) is inset below. Inset opposite is one of the big WeldELLS used in this work.



GUESS-WORK WON'T GO ON THE PIPE LINES

As the demand for oil and gas mounted, the pipe lines grew. The first growth was in number and miles; then in size and pressure. The use of larger pipe lines under higher pressure has hurled a challenge at the pipe designer. To hold down costs he must press further toward the yield point of pipe line materials . . . but never too near the danger point. Sound engineering is indeed required to insure safe operation under loadings that stress materials at 65% to 85% of their yield strength. There is no "margin for ignorance" here. You must *know!*

Recent Taylor Forge contributions to the pipe lines include improved designs of WeldELLS in large sizes and tees giving greater safety at branch connections . . . produced in materials whose strength matches or exceeds that of the tough API5LX pipe now being used in transmission lines.

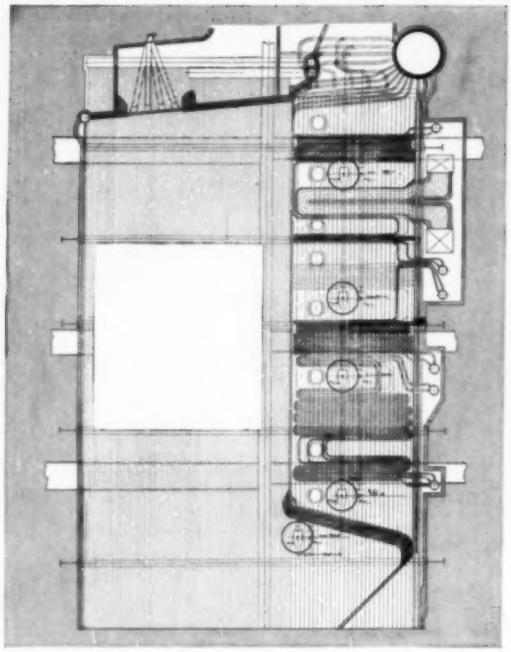
Ask for the facts about the WeldELL line of welding fittings and Taylor Forged Steel Flanges.

TAYLOR FORGE

TF WeldELLS®

TAYLOR FORGE & PIPE WORKS General Offices and Works: P. O. Box 485, Chicago 90, Ill. Offices in all principal cities. Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada.

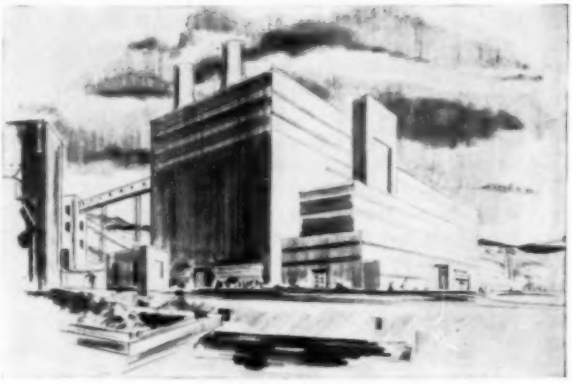
It's VULCAN *at* ELRAMA POWER STATION
4th VULCAN SYSTEM *for* DUQUESNE LIGHT COMPANY



Each of the two B & W radiant-type boilers, fired with pulverized coal, will be equipped with ten air-driven Vulcan Long Retractables blowing with steam under push button control.

For the fourth time in its $112,000,000 post-war expansion and construction program, Duquesne Light Company has ordered Vulcan Automatic Soot Blowers. This latest order is for the new Elrama Power Station near Clairton, Pennsylvania which will add 190,000 kilowatts to the system generating capacity. Each of the two Babcock & Wilcox radiant-type boilers will have a capacity of 900,000 pounds of steam per hour at 1350 psi and 950 degrees F. Each will have ten air-driven Vulcan Long Retractables, blowing with steam under push button control. The swing to Vulcans continues, as alert engineers learn that Vulcan cleans better and costs less to maintain.

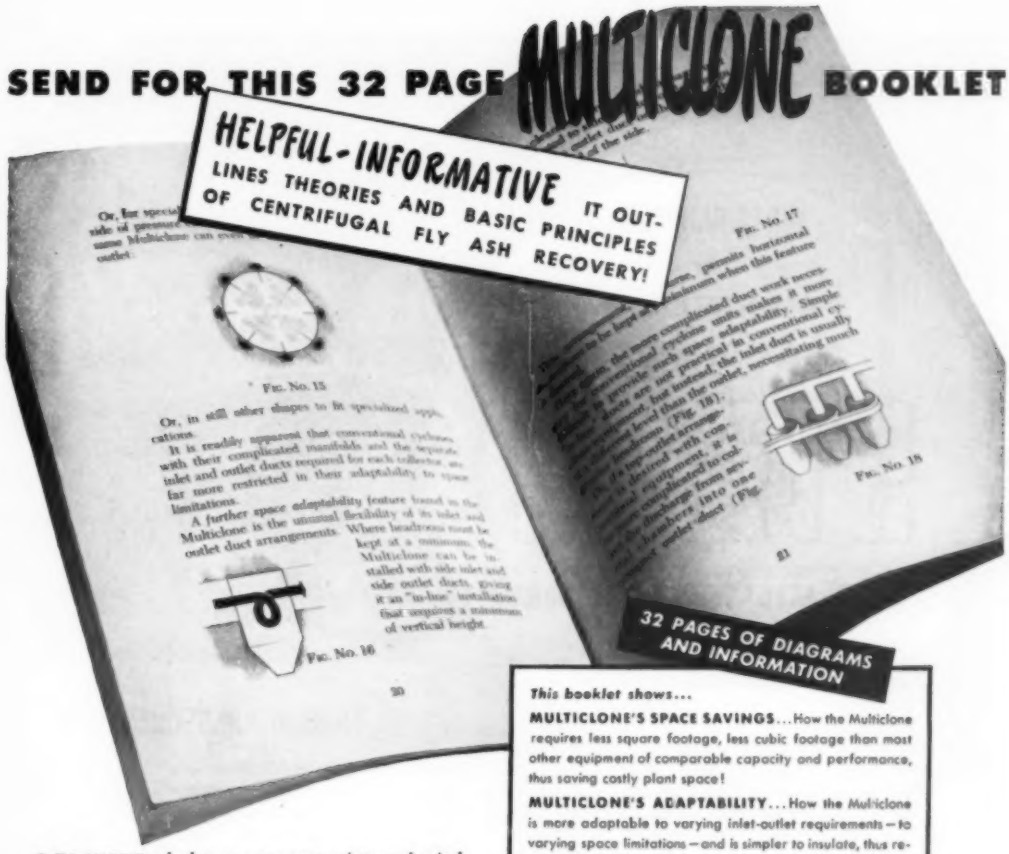
VULCAN SOOT BLOWER DIVISION
Continental Foundry & Machine Company
DUBOIS, PENNSYLVANIA



ELRAMA POWER STATION
DUQUESNE LIGHT COMPANY

VULCAN *Automatic Soot* **BLOWERS**

SEND FOR THIS 32 PAGE MULTICLONE BOOKLET


HELPFUL-INFORMATIVE IT OUTLINES THEORIES AND BASIC PRINCIPLES OF CENTRIFUGAL FLY ASH RECOVERY!
Fig. No. 15
Fig. No. 16
Fig. No. 17
Fig. No. 18
32 PAGES OF DIAGRAMS AND INFORMATION

NO MATTER whether you are now using mechanical dust recovery equipment or are planning the installation of such equipment at some future date, here is a booklet that is full of helpful and valuable information on centrifugal dust recovery. It not only explains the basic methods and principles involved, but also shows the important differences between small and large diameter separating tubes, shows how to simplify your duct work and reduce installation costs, and outlines many other important factors to be considered in selecting mechanical dust recovery equipment.

In addition, this informative booklet illustrates and explains how MULTICLONE'S unique *cone* design is fundamentally different...how it makes possible greater compactness, simpler installation, high recovery of the small particles as well as the medium and coarser ones, and many other facts on MULTICLONE advanced design.

A limited supply of these booklets is available for free distribution to those interested in mechanical recovery equipment and methods. Write for your copy today.

This booklet shows...

MULTICLONE'S SPACE SAVINGS...How the Multiclone requires less square footage, less cubic footage than most other equipment of comparable capacity and performance, thus saving costly plant space!

MULTICLONE'S ADAPTABILITY...How the Multiclone is more adaptable to varying inlet-outlet requirements—to varying space limitations—and is simpler to insulate, thus reducing installation costs!

MULTICLONE'S EFFICIENCY...How Multiclone's multiple *small diameter* tubes, made possible by its exclusive vane design, give higher centrifugal forces and more complete cleansing of *all* suspended particles—even small ones of 10 microns and less!

MULTICLONE'S LOW MAINTENANCE...How the Multiclone has no high speed moving parts to repair or replace, no pads or filters to clean or renew, nothing to choke gas flow or increase draft losses as suspended materials are recovered. Multiclone draft losses remain uniformly low—recovery efficiencies uniformly high—at all times!

Make sure that a copy of this helpful booklet is in your reference files by sending for your copy now!

NOW SELLING...

COTTRELL Precipitators
MULTICLONE Collectors
TURBULAIRE Spray Dryers

...in all parts of the U. S. A. and foreign countries.

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ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

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SIGNIFICANT STATISTICS ON STEAM

FOR MILLIONS OF NEW KILOWATTS

CYCLONE FURNACES

At the close of 1951, B&W's revolutionary method of coal-firing had been applied to boilers with steam capacities ranging from 65,000 to 1,200,000 lb. per hr.; design pressures to 2125 psi; and steam temperatures to 1050F. Reheat, pressurized furnaces, and gas recirculation were other features in many of these units. Fuels include Illinois and West Virginia coals, lignite, oil and gas. Total steam capacity of all Cyclone Furnace boilers in service and on order is over **19,000,000 lb. per hr.**

HIGH PRESSURES

Since 1926, when central station boiler design pressures entered the now widely specified range over 1400 psi, B&W has been "headquarters" for high-pressure units. At the end of 1951, nearly 300 B&W natural-circulation units designed for pressures between 1400 and 2700 psi with temperatures up to 1100F, and including the world's largest boilers, were in service or on order. In the field *over* 2000 psi, more than 50 B&W units have been ordered since 1937, and 12 of them are in full-scale operation with outstanding performance records.

Power companies have taken advantage of this unique experience in the range over 1400 psi for an aggregate high-pressure steam-generating capacity of **187,000,000 lb. per hr.**

PRESSURE FIRING

Steadily-growing demand for this advanced principle of boiler furnace operation reflects the confidence of power companies in its demonstrated advantages of higher boiler efficiency, lower auxiliary power, and other significant economies. More than a score of power companies now have in service or on order over 75 B&W Pressure-fired units with a total steam capacity of **51,910,000 lb. per hr.**

GAS RECIRCULATION

Applications of the B&W methods of gas recirculation for superheat and reheat temperature control almost doubled during 1951. Over 75 units employing this feature are in service or on order, with capacities ranging up to 1,370,000 lb. per hr., and with all types of firing. Total steam capacity of all units having gas recirculation is nearly **75,000,000 lb. per hr.**

REHEAT

New B&W reheat boilers ordered during 1951 raised the total steam-generating capacity of B&W reheat units in service, under construction, and on order to over **95,000,000 lb. per hr.**

NEW UNITS IN SERVICE

During 1951, power companies placed orders for B&W boilers aggregating over 60,000,000 lb. per hr. of steam-generating capacity. In the same period, B&W central station units totalling 28,000,000 lb. per hr. were placed in service. The unique experience and advanced steam technology reflected in these and other statistics presented on these pages are good reasons why you will want to draw on B&W's vast wealth of research and engineering know-how whenever you are considering additional power generating facilities. Its broad and diversified base assures you the most considerate and unbiased approach to your specific requirements—an approach essential to the most efficient and economical solution of any modern power problem.

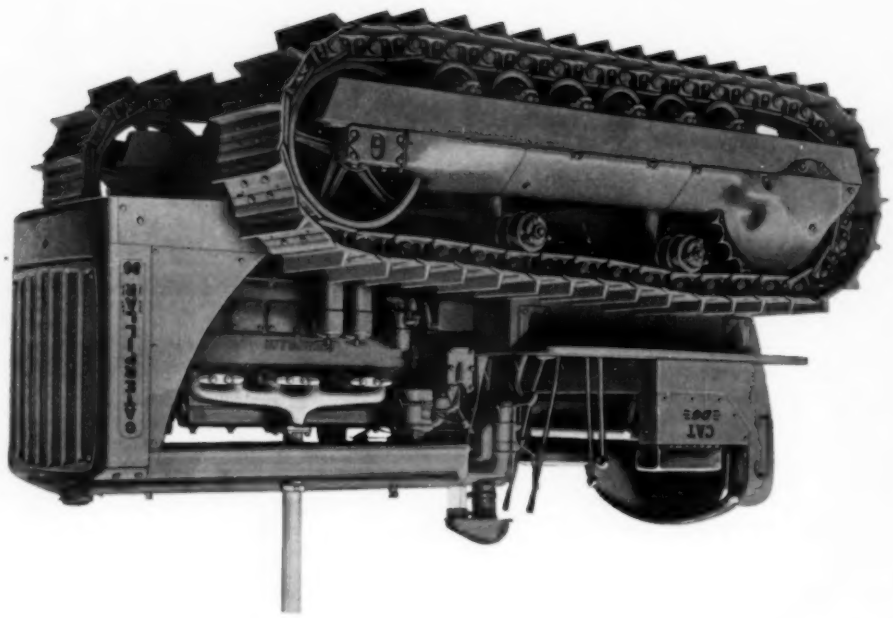
BABCOCK & WILCOX

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET
NEW YORK 6, N. Y.

G-558T

WE TURNED A TRAC

to make the feeder that



WHEN CATERPILLAR TRACTOR CO., Peoria, Ill., recently installed two* Perfect Spread Stokers at its Joliet plant it had a very special reason for confidence. The same high traction principle that has been basic to Caterpillar's own success and leadership is employed in the AE conveyor feeder . . . and this principle assures 100% uniformity of spread; *absolutely prevents clogging on wet coal!*

You can get Perfect Spread Stokers in a wide choice of sizes, capacities and grate types . . . but when it comes to the feeder there is only *one* choice. Every Perfect Spread Stoker is equipped with American Engineering's exclusive conveyor feeder . . . the feeder whose superiority is universally recognized and which assures true, *continuous* feeding whether operating at only 50 lbs. of coal per hour or at top capacity.

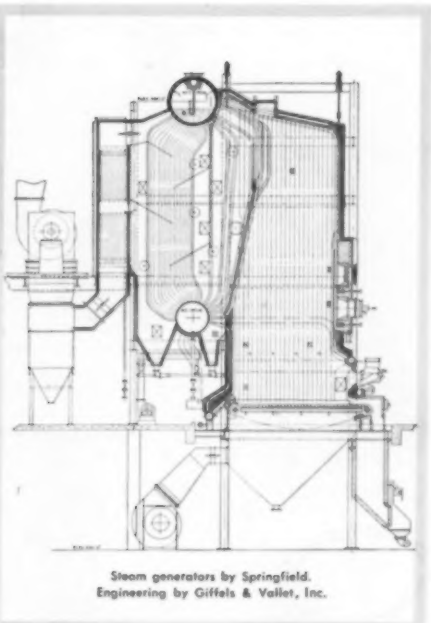
For most steam per fuel dollar, mail coupon on next page . . . today!

***A THIRD UNIT HAS BEEN ORDERED AND IS NOW BEING ENGINEERED.**

TOR UPSIDE DOWN

won't clog on wet coal

On Perfect Spread Stoker's traveling conveyor feeder a special mechanism drives feeder through a widely adjustable speed range – smoothly and continuously . . . Feeder unit protected against furnace temperatures by water and air cooling around furnace opening and rotor bearings . . . Special high-capacity spiral overthrow rotor distributes coal evenly over the entire grate surface . . . AE reinjection system features visible feed ejector hoppers, ejectors and nozzles of alloy iron. Complete reinjection unit serves every cinder drain point.



Steam generators by Springfield.
Engineering by Giffels & Vallet, Inc.

Cross section drawing showing arrangement of boiler components and some of the principal auxiliaries of the Perfect Spread Stoker installations at the Joliet plant of Caterpillar Tractor Co. The two boilers are designed to operate at 80,000 lbs. per hour continuously, with a peak rating of 90,000 lbs. per hour for a two-hour period. Stokers are 12' wide by 14' 3" long, center to center sprockets. Each stoker has three feeders; 171 sq. ft. total grate area with 150 sq. ft. active area; and each is operated by a 1½ hp. 1800 r.p.m. electric motor.

AE

AMERICAN ENGINEERING

COMPANY

PHILADELPHIA 25, PENNA.

AE Products are: Taylor and Perfect Spread Stokers, Marine Deck Auxiliaries, Hele-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers.

American Engineering Company
2421 Aramingo Ave., Philadelphia, Penna.

Gentlemen: – We are interested in getting top efficiency from both low and high ash coals. Please send us full information about Perfect Spread Stokers.

☐ Also send us complete story of *Caterpillar Installation.*

Name..... Title.....

Company .....

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City ..... Zone..... State.....

Yes, Chapman makes cast steel gate, globe and check valves, to ASA and API ratings . . . for all pressures and purposes and in all sizes.

So file this mental note: It pays to check with Chapman on *all* your valve requirements, standard or special. Have you the latest edition of Catalog 20 covering Cast Steel Valves? It's yours for the asking.

The CHAPMAN VALVE Manufacturing Company
INDIAN ORCHARD, MASSACHUSETTS

Timely Comments

Industry's Needs Emphasized by ASTE Industrial Exposition

MATERIALS HANDLING EQUIPMENT is too specialized, machine controls must be simpler and more foolproof, present day cutting tools are not standing up, precision control methods and equipment are too expensive and complicated, and the need for improved metals forming equipment are some of the points emphasized in a recent industry wide survey of large and medium sized plants reported by *Harry E. Conrad*, executive secretary of the 20,000 member *American Society of Tool Engineers*.

Materials Handling—Companies feel that they have to invest too much money and floor space in a variety of specialized types of materials handling equipment, and think that more versatile types could be created by equipment suppliers. Twenty-eight per cent of companies surveyed wanted more automatic materials handling equipment and 24 per cent wanted types that are easier to operate. Medium sized companies placed lesser emphasis on more automatic equipment than large companies. Only 13 per cent indicated need for more specialized equipment.

Machine Controls and Accessories—Ninety-four per cent of the physical effort in producing goods is now performed by machine. What is needed for that other six per cent is either a high degree of training or skill or machine controls so simple and foolproof that even the most unskilled workers can operate them. Simplicity, foolproofing, and versatility are placed ahead of cost.

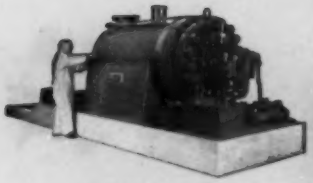
Cutting Tools—Present day cutting tool materials are wearing out too fast under the strains of machining harder and tougher parts. Standardization of tooling has apparently been fairly well achieved. However, 10 per cent asked for more standardization. Ten per cent also reported that they should be able to apply and maintain their cutting tools better, as by instituting tool control programs. Suppliers have met industry's demand for higher cutting speeds and lower tool costs, as only 6 per cent wanted lower cost tools and only 4 per cent higher cutting speeds.

Control Methods and Equipment—Much of the inspection equipment is too complicated and costs too much. The shortage of skilled labor prompts the desire for simpler inspection equipment. Forty-eight per cent of the companies wanted simpler types of equipment and 18 per cent wanted more automatic devices. Thirty per cent wanted lower cost equipment, possible if simpler types are developed.

Metals Forming Equipment—Only 3 per cent of the companies reporting on metals forming equipment indicated that conventional equipment of a relatively standardized nature was satisfactory to meet present and future needs. Among specific types of improvements being sought were more accurate equipment and better tooling, special equipment including bigger presses and improved designs, and equipment permitting faster handling of materials, increased safety and increased versatility.

The A.S.T.E. Industrial Exposition, scheduled in the Chicago International Amphitheatre from March 17-21, 1952, will have as a theme *Tooling for Security*. Technical papers and panel discussions will supplement more than 380 exhibits. The association points out that if we only expand our production facilities to provide maximum output with no attention to cost of production, we can be certain that the economic security of our great system will be endangered. Our industrial plants must produce more pieces per hour per machine.

A 36-MILLION-LB. SQUEEZE

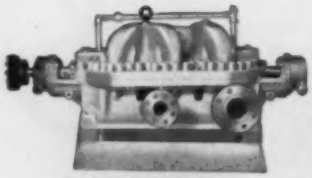


BJ DOUBLE CASE BOILER FEED PUMPS

Designed for high capacity, high pressure, high temperature applications. Capacities to one million lbs. per hour and pressures to 2800 psi. Radial forces are balanced through double volute design and axial thrust is balanced by opposed grouping of impellers.

BJ HYDROPRESS PUMPS

Designed for low capacity, high pressure, high temperature applications. Capacities to 300 gpm and heads to 7000 ft. Basically the same as the Double Case except for vertical construction. The Hydropress saves space, simplifies piping, needs only a simple foundation, and is extremely convenient for inspection and servicing.



BJ MULTIPLEX PUMPS

Type SD Multiplex Pumps are designed for high capacity, medium pressure, medium temperature applications. Capacities to 2000 gpm and heads to 3000 ft. Feature a horizontal split case with crossover passages between stages cast integrally with the case. Staggered volute construction.

FOR BIG PERFORMANCE

BJ

Builds the Best Pump for the Job!

BJ Pumps provide the pressure for the World's largest forging press

WHEN THIS powerful Mesta forging press applies its 18,000-ton might, it presses high-strength billets into intricate parts as neatly as a baker shapes pastry or cookies.

This massive four column die-forging press—the World's largest—was engineered to produce extra large magnesium and aluminum forgings vital to modern aircraft development. Towering 32 ft. high and resting solidly 15½ ft. below the floor, this mammoth machine responds quickly and smoothly despite its 5-million-pound bulk.

The secret of its awesome strength and operating ease is hydraulics—with pressure provided by Byron Jackson pumps.

Three BJ double case 8-stage hydraulic press pumps take water at 100 lbs. per sq. in. and build it to a mighty 5300 lbs. psi pressure force. This high-pressure water is stored in thick-walled accumulators and used to drive the press's 48-in. dia. pistons.

NOTE TO ENGINEERS: Your pumping problem—whether high or low pressure, large or small, standard or special—can benefit from the same sound pump engineering which worked on this job. Byron Jackson Co. designs and builds centrifugal pumps for industrial applications of all descriptions. Bring your pumping problem to BJ—there's no obligation.

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Industry Speaks

SOUTHERN POWER and INDUSTRY
Serving industrial, power and service plants in the 19 Southern and Southwestern states.

Koppers Company and Combustion Engineering—Superheater comment on

Synthetic Liquid Fuels Developments

CHEMICALS will unlock the door to establishment of an American synthetic liquid fuels industry, and that door will be unlocked sooner than most people think. Koppers' Research Department has been engaged in coal carbonization research since 1907 and a newly formed Fuels Processing Section of this department will probe more deeply into the gasification and hydrogenation of coal, with particular emphasis on the chemicals which may be produced.

Gasification and hydrogenation are the two best-known methods for making gasoline from coal and Koppers has conducted extensive research and development work on the processes since World War II, as well as having designed and built a large coal gasification demonstration plant in Missouri for the Bureau of Mines.

New Chemical Fields

Dr. G. F. D'Alelio, research manager of Koppers, emphasizes that while plants to make gasoline from coal are costly to build and gasoline could not presently be produced in them at prices in competition with petroleum gasoline, research is finding ways to produce an increasing number of valuable chemicals in such processes.

These processes can be regulated to produce more chemicals and less gasoline. It is here that upgrading of products may result in a *coal to gasoline* plant becoming economically feasible much sooner than many think.

These chemicals are the building blocks for thousands of other materials. Dr. D'Alelio comments, and Koppers believes that when such plants are built, new chemical fields will be opened, just as perfection of the chemical-recovery coke oven nearly 50 years ago created chemical, tar processing, wood preserving and other industries which are strong and still growing today.

Hydrogenation Pilot Plant

Koppers is now building a pilot plant to make gasoline from coal by the hydrogenation process. This process uses powdered coal in a slurry as raw material, the reactions taking place under high pressure. Gasoline of aviation rating can be made by this system, but a long list of aromatic chemicals such as benzene and other hydrocarbons, as well as phenols and cresols may be obtained.

From direct gasification of coal such as is carried on in the Koppers built plant in Missouri, a synthesis gas containing primarily hydrogen and carbon monoxide is produced. This, in turn, can be the base for synthetic gasoline and many aliphatic chemicals such as alcohols, aldehydes, ketones and the fatty acids which also have wide use in industry.

FIRST COMMERCIAL PLANT

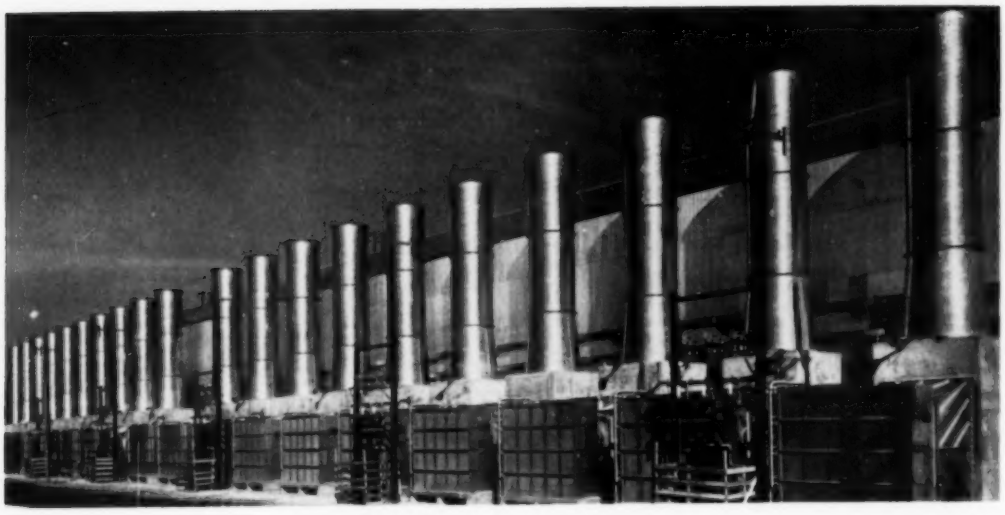
Johannesburg, South Africa, is the location of probably the first commercial plant for making high-octane gasoline from coal. Plant is being built for the South African Coal, Oil and Gas Corporation, Ltd. The M. W. Kellogg Company will act as overall project managers and will be responsible for the design and engineering of process facilities which will include their newly developed Synthol process of synthesis.

Power and Process Steam

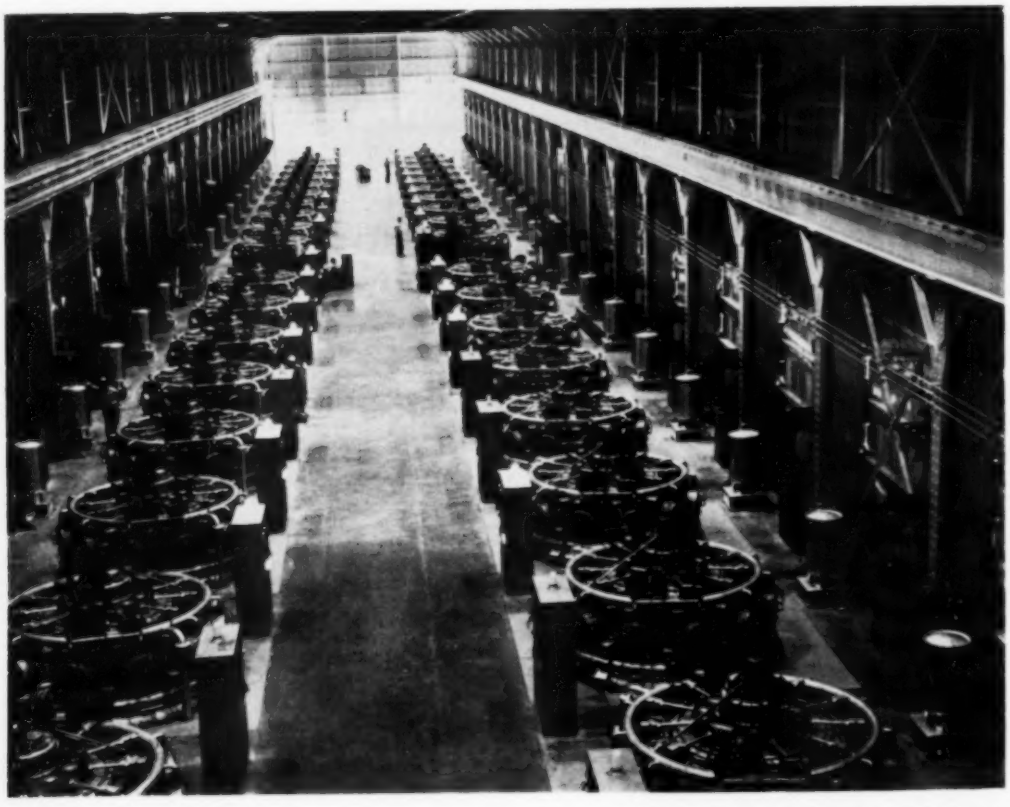
Power and process steam will be supplied by four large boilers being constructed by Combustion Engineering-Superheater, Inc. Each of the boilers will be capable of producing 370,000 lb of steam per hour at 700 psi, 800 F, and will burn coal in pulverized form. Coal, as received, runs about 30 per cent ash and 25 per cent volatile.

While the country does not possess any major petroleum reserves, it does have tremendous deposits of coal available at low cost. It is believed that these deposits can be utilized by the new plant to make the country at least partially independent in the matter of liquid fuels.

While the South Africa plant is primarily designed for volume production of high octane gasoline and diesel fuel, it will also produce such by-products as alcohols and oxygenated chemicals suitable for solvents and other uses. Estimated production of liquid fuels—gasoline and diesel oil—is 65 million gallons a year.



Interior and exterior views of one of the powerhouses at Kaiser Aluminum and Chemical Corporation's Chalmette, Louisiana, plant. *Above:* Trane fluid coolers handle the lube and jacket water cooling for the 80 Nordberg gas-burning radial engines. Burgess snubbers are installed in each stack for muffling purposes. *Below:* 40 of the 80 engines rated 1820 hp at 400 rpm and driving 1290 kw direct current generators.



POWER for ALUMINUM PRODUCTION

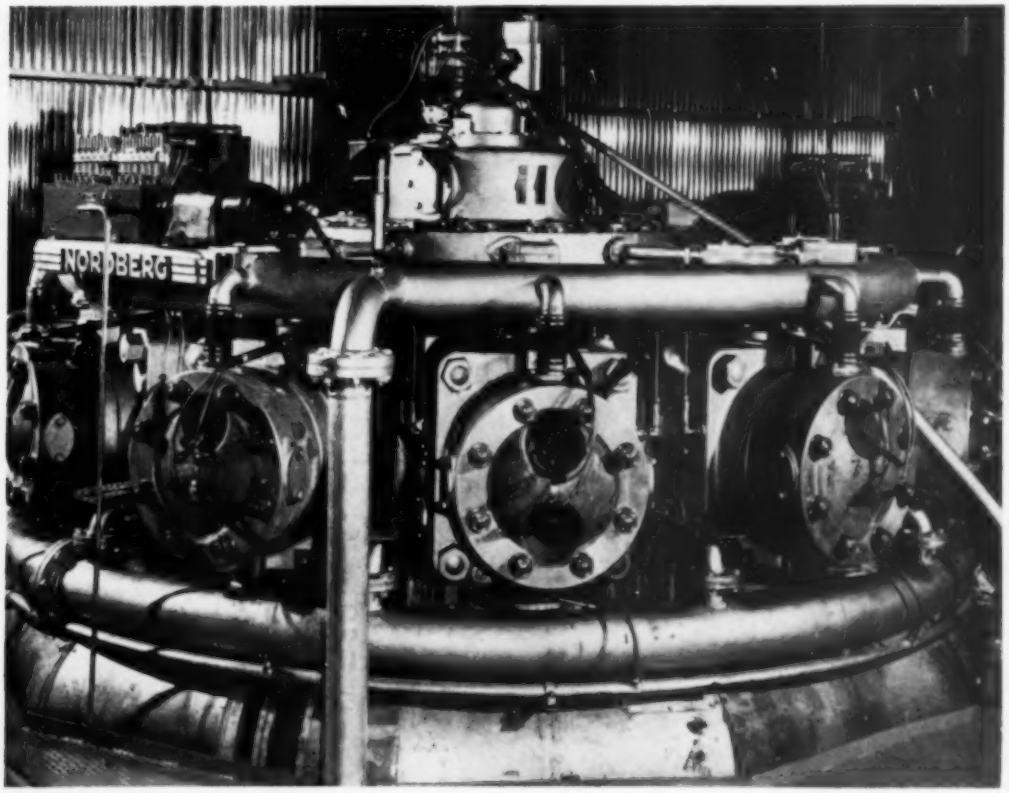
Kaiser Aluminum and Chemical Corporation's Chalmette, Louisiana, operation to be largest primary aluminum producer in country.

478,200 kw
Two Power Plants

- *2 potlines (now in operation) fed by 80 Nordberg radial gas engines.*
- *Power for remaining 6 potlines and plant services to be produced by a semi-outdoor steam plant—15 steam generators and 16 turbo-generators.*

IN December, 1951, less than ten months after construction was started the first aluminum pig was poured at Kaiser Aluminum and Chemical Corporation's huge Chalmette, Louisiana, plant on the

Close-up of one of the Nordberg gas-burning radial engines shows Manzel lubricators, Woodward governor and American Bosch ignition system. 80 of these engines supply approximately 150,000 hp for the first two potlines of the Louisiana aluminum reduction operations.



Mississippi river near New Orleans.

When completed, the operation will contain some 75 buildings with nearly 35 acres of floor space, and some 3½ miles of rail trackage. Its annual raw material requirements will include 530,000 tons of alumina, carbon and other minerals and chemicals. It will be the largest primary aluminum producer in the country and is one of four new reduction plants being constructed in the South and Southwest.

Eight Potlines

The eight potlines comprise 16 potroom buildings, two for each potline, lined up side by side. Each *room* measures 960 ft x 59 ft and contains 72 Soderberg-type pots, or electrolytic cells, which individually produce aluminum at a rate of 40 lb/hr.

A metal service building, 1650 ft x 60 ft for most of its length, connects the bases of the potrooms and provides facilities for pouring molten aluminum into pigs up to 1,000 lb and handling their storage and shipping.

Power Supply

The 2 potlines now in operation are fed by 80 Nordberg gas-burning radial engines rated 1820 hp at 400 rpm and driving 1290 kw direct current generators. Power for the remaining 6 potlines and plant services will be produced by a semi-outdoor design steam plant —15 steam generators and 16 turbo-generators. The latter is now under construction.

Radial Engine Installation

The 80 Nordberg radial engines, which provide the power for the first two potlines, form Louisiana's largest internal combustion engine power plant. These engines are of the two-cycle type with 11 cylinders of 14 in. bore and 16 in. stroke. Because of the abundance of natural gas fuel in the southern Louisiana area, these engines are of the gas burning type, incorporating an advanced design spark ignition system. Each engine develops 1820 hp at 400 rpm and drives a General Electric 1290 kw direct current generator.

The engines are designed to give simple, compact economical power. Their ability to burn gas efficiently permits this large internal combustion engine plant at Chalmette to produce power at very low cost which compares favorably in generating cost with hydro-electric power and steam power.

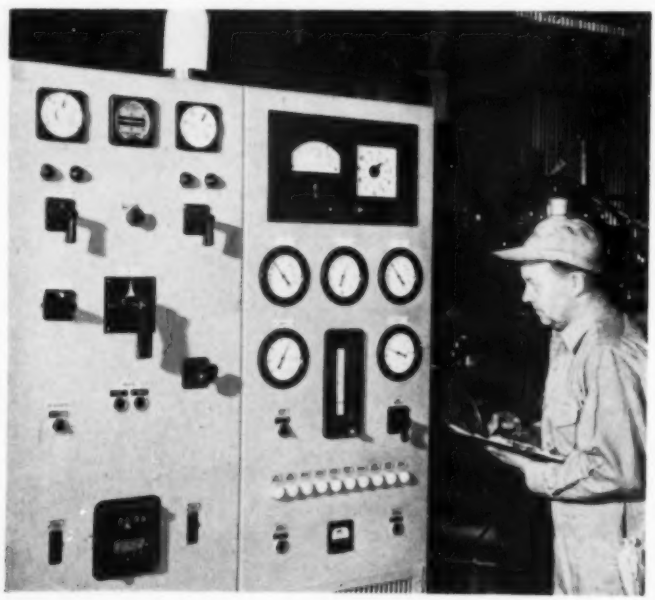
Cylinders are equally spaced in a horizontal plane radially around a vertical shaft. The cylinders fire in consecutive order. Perfect balance is achieved by actual convergence of combustion pressures and inertia forces at one focal point on the crankshaft axis. This results in a vibrationless engine which permits the use of a simple, inexpensive foundation—down to 20 per cent of usual requirements. The compact cylinder arrangement reduces engine floor space to one-half the usual requirements.

The engines are divided into two groups of 40 each, housed in two steel frame buildings covered with corrugated aluminum. Each building measures 482 ft long, 55 ft wide and 58 ft high.

Each direct current electric generator of 1290 kw at 700 volts is mounted directly below the engine and is connected by coupling. This method of generating direct current eliminates the need of building rectifier stations with the consequent losses that occur in transforming alternating current to direct current.

Each engine-generator unit has its own control cubicle including starting relays, engine instruments and protection equipment. The protective equipment shuts off the engine automatically in the event of high water, high exhaust or high generator temperatures, low oil pressure or loss of auxiliary power.

Starting relays, engine instruments and protective equipment are contained in each of the control cubicles.



In addition to these unit control cubicles, a two-story control house is located between the two engine buildings. From this location the overall operation of the Nordberg units can be observed and the load governed as required. Normally, 37 engines in each building will be in operation and three will be standby. In emergencies all engines of one power house can operate and six engines can be idle in the other one and the control house between the two equalizes such a situation.

With each engine-generator, there is required 160 hp in auxiliary motors. These are rated at 440 volts, 3 phase, 60 cycles, and are supplied from load center substations in the conventional manner for industrial plant loads. The

Principal Equipment and Auxiliaries—Gas Engine Plant

Engines ..... Nordberg Mfg. Co., gas-burning Radial, 11 cylinder, 14" bore, 16" stroke, 1820 hp, 400 rpm.
Generators ..... General Electric Co., 1290 kw, 400 rpm, 700 volts.
Exhaust Silencers ..... Burgess-Manning Co.
Intake Filters ..... American Air Filter Co.
Lube Oil Coolers ..... Trane Co.
Jacket Water Cooler Motors ..... Reliance Electric & Engineering Co., 25/6.25 hp, 720/360 rpm.
Motor Driven Scavenging Blower. Buffalo Forge Co., 7250 cfm capacity.
Scavenging Blower Motors ..... General Electric Co., 125 hp 3 phase, 60 cycle, 440 volt, 3550 rpm.
Lube Oil Pumps ..... De Laval Steam Turbine Co., 165 gpm., 50 psi.
Lube Oil Pump Motors General Electric Co., 10 hp, 1750 rpm, 3 phase, 60 cycle, 440 volt.
Jacket Water Pumps ..... Allis-Chalmers Mfg. Co., 400 gpm at 45 feet head.
Jacket Water Pump Motors ..... Allis-Chalmers Mfg. Co., 5 hp, 1750 rpm.
Lube Oil Transfer Pumps ..... De Laval Steam Turbine Co., 6 to 40 gpm, 50 psi.
Lube Oil Transfer Pump Motors .. Master Electric Co., 60 cycle, 5 hp, 3 phase, 440 volt, 1750 rpm.
Lube Oil Purifiers ..... Honan-Crane Corp.
Alarm System and Control Cubicles ..... General Electric Co.
Exhaust Pyrometers ..... Almor Instrument & Pyrometer Co.
Lube Oil Storage Tanks ..... Niles Steel Tank Co., 8 Tanks, 2500 gal.
Gauges (Lube Oil) ..... King Engineering Corp.
Tachometers ..... James G. Biddle Co.
Centrifuges (Lube Oil) ..... Sharples Corp.
Lubricator Motors ..... General Electric Co., ¼ hp
Lube Oil Sump Tanks ..... Beeson Tank Co., 650 gal aluminum Tanks
Exhaust Pipes ..... Milwaukee Reliance Boiler Works
Potline Exhaust Fans ..... Buffalo Forge Company
Ignition System ..... American Bosch Corp.

480 volt systems are all grounded being supplied by transformers rated at 500 kva, 13,800-480 Y/277 volts.

Engine Operation

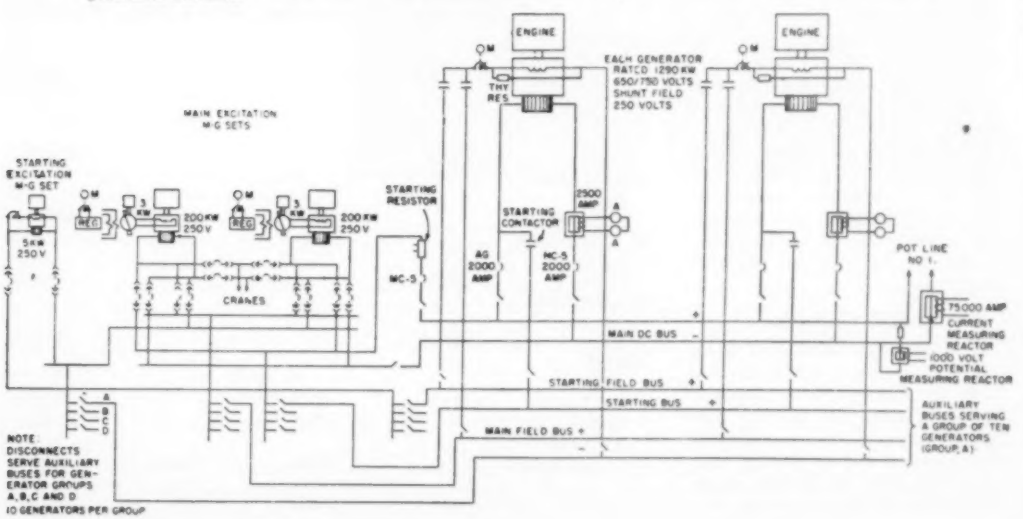
The engines are started electrically, using the main generator as a motor until the set reaches a speed that allows the engine to fire and take over. The cubicle located near each engine contains protective and alarm devices, instruments, and starting equipment. An operator at this cubicle starts the set, parallels it with the running machines on the potline bus, and then transfers voltage control to a master control panel.

Natural gas is delivered by the United Gas Pipe Line Company through a 16 in. pipe line to the plant station which scrubs and meters the gas and reduces the pressure to plant requirements for distributing it to the power plants.

Each engine works up a heat load of nearly 3,000,000 Btu in an hour which is transmitted to the jacket water and lube oil. Also an adequate supply of air must be provided for the engine room. About 7,000 cfm are lost through combustion and exhaust of each engine; another 12,700 cfm are exhausted by each of 80 generator cooling fans. This air, properly filtered and tempered, must be *made up* to maintain proper pressure in the room. The jacket water and lube oil of the 80 engines are cooled in 80 Trane dry type fluid coolers. Each of these units consists basically of two fin and tube coil circuits through which oil and water flow, and a propeller fan which draws air over the coils.

Jacket water and oil flow in separate three-row coil circuits, each forced by separate circulating pumps. Air at temperatures up to 100 F is drawn over the coil circuits. This air flows over the oil circuit, cooling oil from 147 to 127 F. The heat load from the lube oil of each engine is 713,000 Btu/hr. After passing over the oil circuit, the air flows over the jacket water coils, cooling the water from 155 to 145 F. The jacket water load of each engine is 2,030,000 Btu/hr. The 84 in., six-blade fan is driven by a two-speed 25 hp motor at top

Electrical diagram of engine-generators and associated equipment for one potline. Total of 40 engine-driven d-c generators are used.


ENGINE
ENGINE
EACH GENERATOR RATED 1290 KW 650/750 VOLTS SHUNT FIELD 250 VOLTS
MAIN EXCITATION M-G SETS
STARTING EXCITATION M-G SET
5 KW 250 V
200 KW 250 V
200 KW 250 V
CRANES
STARTING RESISTOR
STARTING CONTACTOR
2500 AMP
AG 2000 AMP
MC-S 2000 AMP
MC-S
POT LINE NO 1
75000 AMP CURRENT MEASURING REACTOR
1000 VOLT POTENTIAL MEASURING REACTOR
MAIN DC BUS
STARTING FIELD BUS
STARTING BUS
MAIN FIELD BUS
AUXILIARY BUSES SERVING A GROUP OF TEN GENERATORS (GROUP A)
NOTE DISCONNECTS SERVE AUXILIARY BUSES FOR GENERATOR GROUPS A, B, C AND D 10 GENERATORS PER GROUP

speed; with higher entering air temperatures, the fan runs at 720 rpm, with a volume of 78,000 cfm. When the air temperature drops, the motor automatically shifts to its second speed of 360 rpm. This results in a 39,000 cfm output to maintain design conditions and corresponding savings in horsepower requirements. Fan blades are adjustable in pitch to vary air flow in order to meet seasonal temperature variations.

On the air inflow, 80 all-aluminum Trane air washers handle the job of supplying *make-up* air to the engine room. Each of these units provides 35,000 cfm of filtered ventilation air to compensate for the 30,400 cfm used and exhausted by each of the 80 engines and exhaust fans. Thus, a slight positive pressure is maintained in the engine room.

Air, mixed with spray water, is drawn by a propeller fan through the flow passages of a brazed aluminum air washer. The spray water picks up 99 per cent of the fine aluminum dust particles that may be present in the air as it flows through the washer. Six water *brakes* act as baffles in the unit to prevent excessive water loss as the air leaves. Some evaporative cooling is also accomplished as the air passes through the aluminum washer. Entering air at 100 F dry bulb is cooled at 78.5 F dry bulb. The wet bulb temperature of 75 F does not change. The air washer has a closed spray system, with a 175 gpm pump, powered by a 2 hp motor.

All air filtration for the engines is handled by dry type American Air-Filters installed on the engines at the scavenging blower intake. These filters of the Airmat type also serve an additional purpose by eliminating some of the moisture which occurs due to excessive humidity in the southern part of Louisiana.

Other Auxiliaries

The high pressure scavenging blowers installed at Chalmette were built by Buffalo Forge Company and are driven by 125 hp, 3600 rpm, General Electric motors. Buffalo also supplied 80—54 in. tube-axial fans, 7½ hp electric motors for the fresh air supply and 64—100 in. MW fans for V-belt drive of 75 hp, 1200 rpm electric motors used for potline exhaust.

Accessory equipment for each engine consists of a pair of Manzel model 82-D lubricators driven by ¼ hp General Electric motors. Pulse generator, high tension dual ignition distributor, two high tension coils and two rectifiers were supplied by American Bosch and the governors for each engine by Woodward.

The outstanding feature of the individual control cubicles is the Alnor pyrometer which combines a motor driven switch. This continuously operated pyrometer indicates the exhaust temperature of each of the 11 cylinders automatically and should any cylinder reach a predetermined high level, a relay is tripped and the engine shut down.

On this same control board is found the Frahm tachometer and the Meriam manometer. In general operating procedure, the engine cannot be started unless all of the accessory units are in full operation. In other words, the scavenging blower is started, the air intake fan is started, the fluid cooler for lube oil and cooling water is started, and all of the accessory lights have to show white on the board before the operator can press the start button. The engine room crew at Chalmette is small and efficiently organized. There is one shift foreman for the two engine rooms and a control operator in the master control room. There is also one man on the top floor and one man on the bottom floor of each engine room.

Because of the proximity of the Kaiser plant to the residential sections of New Orleans, Burgess snubbers have been mounted in the exhaust stacks to silence the exhaust noise.

The lubricating oil system has been efficiently arranged for ease of handling. There is a pair of 26,000 gal lube oil storage tanks outside, and inside each building there are four auxiliary storage tanks, each of 5,000 gal capacity—two for clean oil and two for used oil.

There are also four cylinder oil storage tanks of 500 gal capacity, mounted toward the middle of each engine room on each side. In the

By the end of 1953, six Southern and Southwestern states will be producing approximately 55 per cent of the country's primary aluminum. Kaiser's Chalmette, Louisiana, plant will be the country's largest producer.

Annual Primary Aluminum Capacity (South-Southwest)

(Millions of pounds)

	Now In Operation	Now Under Construction	Planned During 1953	Total Capacity
ARKANSAS				
Reynolds				
Jones Mills	189.0			189.0
(New Site)			110.0	110.0
ALABAMA				
Reynolds				
Listerhill	100.0			100.0
LOUISIANA				
Kaiser				
Chalmette		200.0	200.0	400.0
N. CAROLINA				
Alcoa				
Badin	86.7			86.7
TENNESSEE				
Alcoa				
Alcoa	290.6			290.6
TEXAS				
Alcoa				
Pt. Comfort	114.0	70.0		184.0
Rockdale		170.0		170.0
Reynolds				
Corpus Christi		150.0	10.0	160.0
	780.3	590.0	320.0	1690.3

basement of each power house there are 40 tanks of 750 gal capacity. Lube oil purification is handled by 80 Honan Crane purifiers, 40 in each building, which work on a by-pass system. When necessary, the sump tanks can be drained and the oil piped to the dirty oil tanks at the end of the building. Here the oil is allowed to settle for a reasonable length of time, then put through two Sharples centrifuges in the basement and returned to the clean oil tanks for service. De Laval 165 gpm lube oil pumps, operated by 10 hp General Electric motors, are used to keep the oil moving. A group of De Laval pumps are also used for lube oil transfer from the main supply tanks outside the building into the clean oil storage tanks.

A Rockwell-Emco gas meter and a pair of Mason-Neilan gas regulators are located outside of each of the two Nordberg gas engine power houses.

Steam Power Plant

Electricity for the remaining six potlines and for various other plant services at Chalmette will be produced in a steam power plant. This plant, not yet in operation, will be made up of 15 steam generators and 16 turbo-generators. It will be of the semi-outdoor type with boilers located outside and the turbines in a 750 ft long building to which will be attached a large electrical bay. Also connected with the steam plant will be a rectifier station to convert the alternating current from the generators into direct current.

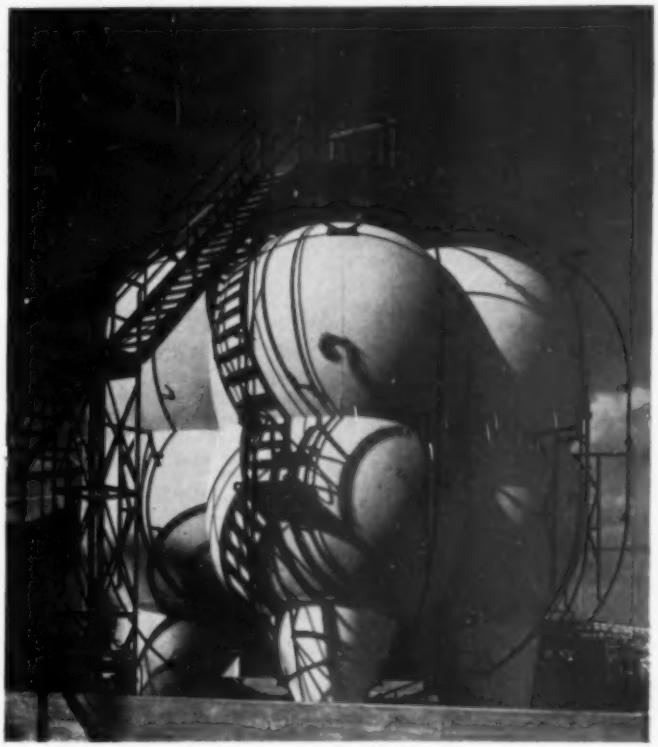
Engineering Personnel

In planning and building the New Orleans aluminum plant, Kaiser Engineers have successfully solved major problems of widely varied types—from coping with the drainage and foundation problem rising from a water table only a few inches under the ground, to designing two different types of power plants of major size, raw material handling and processing facilities, metal handling equipment as well as the huge reduction potlines themselves.

Directing execution of the entire Chalmette plant project are *George Havas*, vice president, general manager and chief engineer of Kaiser Engineers; *L. H. Oppenheim*, assistant general manager and assistant chief engineer; and *E. C. Anderson*, manager of the aluminum division of Kaiser Engineers.

Key engineering personnel of the Chalmette aluminum reduction operation are *C. P. Lowe*, works manager; *W. W. Watkins*, power superintendent; *L. S. Newman*, production superintendent; *John Nargang*, maintenance superintendent; and *W. T. Brown*, ind. relations.

Fourteen Lobe Multisphere at Dow Chemical, Freeport, Tex.



Another unusual Horton Multisphere has been designed by Chicago Bridge & Iron Company for the Dow Chemical Company's Freeport, Texas operations. This fourteen lobe unit is known as a two story structure — six lobes around and two stories high, with one lobe on the bottom and one on the top. Tank has a capacity of 2,500 bbl of liquefied petroleum gas and is designed for a working pressure of 150 psi. It was tested hydrostatically at 225 psi.

Tank is 31 ft 4 in. wide and 27 ft high. Spherical radius of side plates is 7 ft 10 in. and head plates have a spherical radius of 9 ft 7⅛ in. Tank was made of A-201 Grade B steel by the Chicago Bridge & Iron Company. Side plates are 0.62 in. thick and bottom and top head plates 0.77 in. thick. Approximately 58 per cent of the plates in the vessel were dished to a spherical radius and 42 per cent are flat diaphragms. The multi-lobe design permitted the use of lighter weight plates. Contents pass from one lobe to another through holes in the internal supporting diaphragms.

Ford Division of Ford Motor Company, Dallas, Texas, reports on

What Every Truck Driver Should Know

Data has been compiled from a Drivers Training Course conducted at the Ford Division of Ford Motor Company, Dallas, Texas, by *Wendell Logan*, training supervisor; *Bruce Odell*, material handling engineer; and other supervisory personnel.

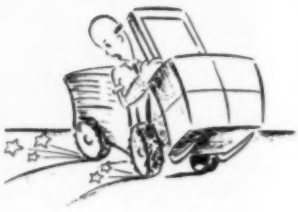
AS a heavy user of industrial trucks, the Ford Division, Ford Motor Company, Dallas, Texas, is interested in getting the most possible out of these pieces of materials handling equipment. They have found, through experience, that keeping industrial trucks in good condition is primarily a driver's problem. In view of this, they have concentrated on driver training. Results in preventive maintenance have been excellent.

One driver training course was conducted for an hour a day every day for a week. All twenty-one of the industrial truck drivers in the Dallas plant attended the meetings, and each contributed his suggestions for increasing service while reducing costs.

In the Dallas plant there is a shop set up for the sole purpose of repairing industrial trucks. These trucks are taken to the shop on a regular schedule for overhaul and repair, but every effort is made to impress the drivers with their responsibility for preventive maintenance on the job.

Part of every driver's training is a booklet which shows in words and pictures just how the driver can do his part to keep his truck in good mechanical condition. These suggestions are worth the attention of every truck driver in every type of industrial plant.

As is pointed out in the training booklet, the industrial truck is a piece of high precision equipment and requires careful and constant attention. Every industrial truck driver should know the mechanical principles of his truck in order that it may receive proper attention and in order that he may be able to drive it both intelligently and carefully. If every driver follows the practices of the best truck drivers, accidents and breakdowns can be cut in half.



Tires

Electrical System

Tires—If pneumatic tires are used, keep them inflated to recommended pressure . . . avoid quick starts and turning corners at high speeds . . . never drive on a flat tire . . . never spin drive wheel when starting.

Electrical System — Avoid sudden drains on battery . . . avoid excessive "inching" . . . read ammeter regularly to make sure battery is being charged . . . see that battery is securely mounted and is not leaking . . . never operate electric units which are arcing . . . never completely discharge battery operated trucks before recharging.

Cooling System

Fuel System

Cooling System—Always maintain correct water level—check all hose connections . . . check for leaks . . . inspect fan belt for proper adjustment . . . do not add cold water to an overheated engine . . . if overheating occurs allow engine to cool slowly.

Fuel System—Make sure you have sufficient fuel . . . be sure the gas tank cap is replaced . . . start and accelerate vehicle smoothly . . . stop your engine if you have to wait several minutes as an idling engine will use as much as a quart of gasoline during two ten minute stops . . . never operate vehicle with leaking fuel system.

Preventive Maintenance Will Pay You Dividends

Frequent checks and adjustments may prevent many mechanical troubles. At the first sign of wear or faulty operation, the truck driver should report it and have it corrected. These specific rules on preventive maintenance will assist you in keeping your truck in A-1 condition.

Brakes

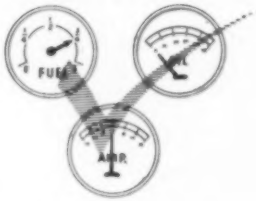
Brakes—Always check brakes before starting . . . if pedal can be depressed to within 2 in. of the floor board, have brakes adjusted . . . avoid quick stops . . . make certain that the brakes stop the equipment smoothly without side pull, and within a reasonable distance . . . make certain the emergency brake is in good working condition.

Clutch

Clutch—Prevent clutch wear by keeping loads to rated vehicle capacity . . . when stopping on an incline, do not use clutch as a brake . . . be sure clutch pedal has at least 1½ in. of play, but not more than 2 in. A tight clutch will burn up; a loose clutch will be inefficient . . . release clutch slowly . . . avoid engaging clutch when engine is racing . . . do not ride the clutch pedal . . . make certain clutch is operating smoothly, without chattering, grabbing, or slipping.

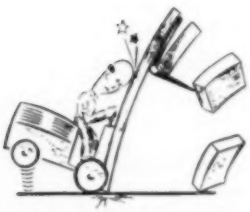
Steering Mechanism

Steering Mechanism—Test steering adjustment and free motion of steering wheel . . . check for excessive free play, binding, slipping, or pulling to one side . . . avoid bumping steering wheels against solid objects. This can cause severe damage to steering mechanism and physical damage to operator.



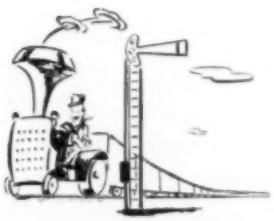
Instruments

Instruments—Inspect ammeter, fuel gage, and oil pressure gage for proper operation . . . observe all instrument readings during operation to see if they are indicating properly . . . check to see that all instruments are securely mounted and properly connected.



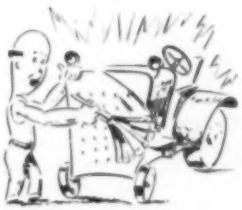
Lift and Tilt Mechanism

Lift and Tilt Mechanism—Listen for unusual noises . . . observe whether the hoist and tilt cylinders are operating satisfactorily without creeping or settling . . . make certain there is no lag or pounding in any part of the mechanism . . . check for leaks and maintain proper hydraulic oil level in tank at all times . . . check lift and tilt controls for operation . . .



Towing Connections

Towing Connections—Inspect towing connections for secure mounting . . . make certain locking device operates properly . . . check for damaged connections.



General Appearance

General Appearance—Keep vehicle clean . . . report all damaged parts and faulty action . . . report all body rattles . . . keep windows, headlights, and tail lights clean . . . examine counterweight, fenders, and side panels for secure mounting and condition.

Engine and Transmission

Engine and Transmission—Start and warm up engine properly . . . do not clash gears when shifting . . . while driving check oil pressure gage . . . when refueling, have oil level checked; if oil appears dark, recommend change . . . check oil filler cap . . . observe, when starting the motor, any unusual noises, and note starting speed . . . while warming up engine, push in choke as required for smooth operation and prevention of oil dilution . . . gear shift mechanism must operate smoothly and not creep out of mesh . . . listen for excessive hum in gears . . . make certain that the engine idles properly . . . listen for misses, backfire, other sounds or vibrations that might indicate worn parts, loose fittings, faulty fuel mixture, or faulty ignition . . . never operate an engine with low oil pressure . . . stop engine if water temperature is above safe normal range.

General Safety Rules—Ford Division of Ford Motor Company, Dallas, Texas

General Rules

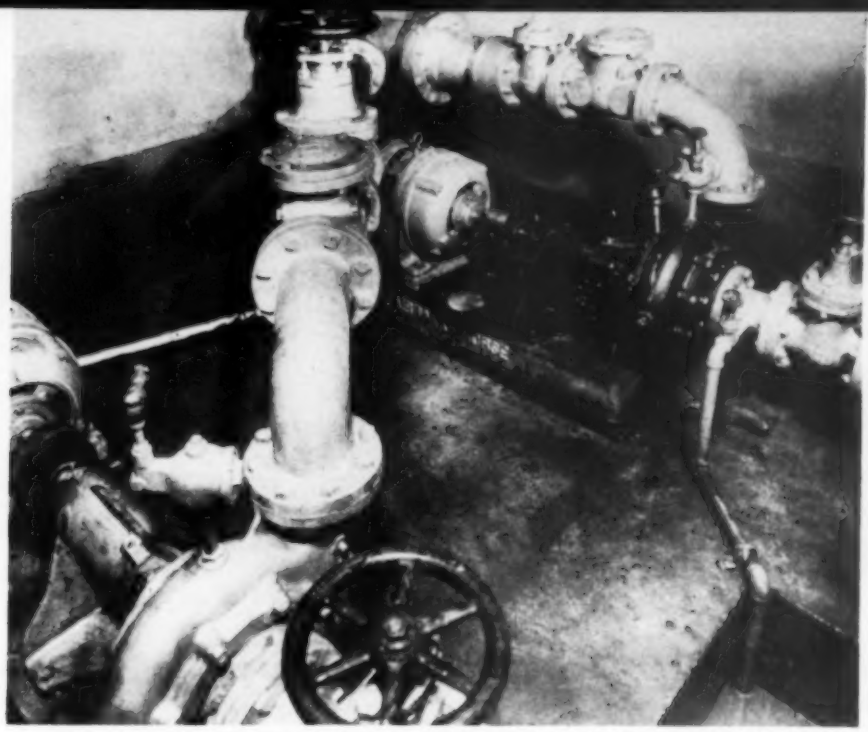
1. During operation be alert for walking or standing employees and for other vehicles.
2. Always drive at a moderate rate of speed.
3. Obey all traffic signs and signals.
4. When approaching aisleways, slow to a minimum speed.
5. Never drive over any object on floor or roadway. Avoid projecting materials.
6. Forbid an unauthorized person to drive your equipment and never allow any person to ride on your truck.
7. Racing, chasing of employees and other horseplay has no place in the plant. Avoid it.
8. Never smoke when truck is being refilled with gasoline. Shut off motor.
9. Always keep hands, arms and feet inside the running lines of your equipment.
10. When parking equipment, remove key and set the brake. Never park in fire lanes.
11. When waiting at elevator gates, "cramp" wheels and keep equipment at an angle to the gate.
12. Know the capacity of your truck and never move a doubtful load.
13. Report needed repairs to your supervisor at once.
14. Be sure you have clearance when traveling under conveyors or other overhead structure.
15. While truck is on elevator, shut off motor and set brakes.
16. Report all damage to your equipment, major or minor, to your supervisor immediately.
17. Get a safety permit before driving or training for driving any industrial vehicle.

Fork Lift Trucks

1. Always carry the load against the lift plate of the fork lift truck.
2. Always watch your load when raising or lowering forks.
3. Test your load and never pick up a load that is not stacked to prevent tipping.
4. If in doubt of the weight or stacking of load, call your supervisor at once.
5. When in motion, keep forks within twelve inches of the floor or ground.
6. Do not allow any employee to ride load or equipment at any time.
7. Before entering box car, test dock ramp to be sure load can be carried.
8. Use the tilting device if your equipment is so manufactured.
9. Avoid sudden or jerky stops.
10. Use extreme caution when stacking or tiering loads to prevent slipping or falling of entire load.
11. Do not raise or lower hoists when traveling; lower when empty or parked.

Tow Trucks

1. When coupling tractor to a train of trailers, back to coupling slowly.
2. Drive sufficient distance from building or platform so sway of trailers will not hit.
3. Use low speed when going up or down incline, ramp, or grade.
4. Avoid accidents. At corners see that trailer standards are turned in proper direction.



These two bladeless horizontal trash pumps in a Baltimore sewage station have handled industrial waste and hospital refuse such as towels, bandages and cotton for more than 14,000 hours without clogging. Each pump is rated at 320 gpm at 72 tdh, and is driven by a 15 hp motor.

Baltimore sewage system cures headache with

Bladeless Trash Pumps

THE Joppa Road Pumping Station of the Baltimore County Metropolitan system, with a capacity of 500,000 gpd, gathers sewage from a broad area and pumps it down the main line to the treatment plant. Most of the area served is residential but two factors make Joppa the headache of the system. *First*, five industrial plants discharge a variety of difficult waste products into the line. *Second*, a nearby tuberculosis hospital sends through the pumps a large volume of rags, towels, bandages, and cotton. Actually, a high percentage of the sewage handled by this station is the kind of fibrous solid that clings to impeller blades and clogs pumps.

Two improved type "non-clog" trash pumps were installed in 1941 but failed to meet the challenge. This originally was designed as an automatic station but, according to Superintendent of Maintenance *Berley Ambrose*, it was necessary to visit Joppa Road twice a day to service pumps clogged with rags, towels and other waste.

New Installation

Immediately after the formal announcement and demonstration of the new Fairbanks-Morse bladeless sewage and trash pumps, *George W. Welsh*, Assistant Chief Engineer of Construction and Maintenance for the Baltimore County Metropolitan District, ordered two 4-in. pumps of the new type and direct-connected them to 15 hp, 1750 rpm motors that were already in the Joppa Station.

The new pumps were installed on January 12, 1950, and have been in continuous operation ever since. Not only does the same type of sewage pass through the station but the quantity has increased greatly in the past year. Yet, Mr. Ambrose reports, there has been no pump clogging or operating time lost. Even while the screening bars were removed temporarily for repairs, the bladeless pumps continued to handle sewage with no evident change in operating effectiveness.

Each of the two pumps has been in service nearly 14,000 hours without clogging, and the station is now completely automatic. There is no operator in attendance and the only servicing required is to lubricate the equipment once every four or five months.

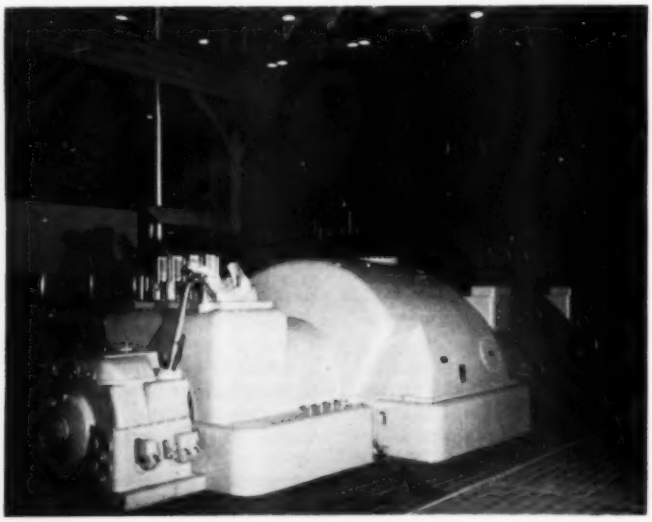
The new A. W. Higgins Plant is on a peninsula in Tampa Bay near St. Petersburg.

Florida Power Corporation at St. Petersburg installs

First 40,000 kw in Higgins Plant

This is the first of three 40,000 kw generating units planned for the Higgins Plant. Previously no units larger than 25,000 kw had been installed

By R. B. LEE
Assistant Superintendent Production
Florida Power Corporation



EARLY in 1948, Florida Power Corporation realized that existing generating equipment would not be sufficient to meet the system requirements in 1950. A new unit had been purchased for installation in the Bayboro Plant at St. Petersburg, but this would not provide the necessary increase.

The system covers approximately 20,000 square miles, and 4 steam plants had been located according to maximum load areas and geographic advantages. Due to the wide variation between minimum and peak demands, no units larger than 25,000 kw had been installed.

The 40,000 kw, General Electric Company turbine-generator, 1250 psi, 950 F.

The predicted loads for 1950-51 indicated that a larger unit could be used to advantage without introducing too much danger to domestic demand in case of failure. A 40,000 kw generator was immediately ordered for delivery in late 1950.

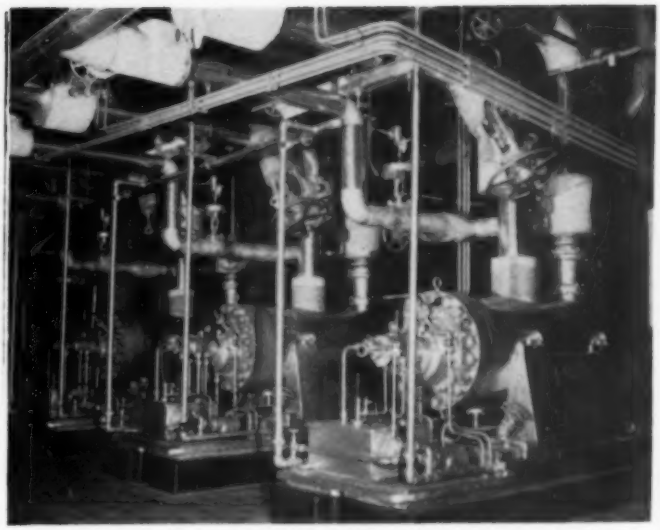
Plant Location

There are 3 major requirements for picking a steam plant location: adequate cooling water, low cost of fuel transportation, and minimum transmission loss to points of distribution. A peninsula extending into upper Tampa Bay was chosen. It provides all the water needed and recirculation of the discharge water is prevented by topography of the site. A channel could be provided for transporting fuel oil in barges from the company's major tank storage at Port Tampa. This location was central to high load centers on the west coast and in the southern portion of the system. It was also possible to build the plant on ground which had never been under water during a storm, according to available records.

Building

Semi-outdoor and outdoor plant construction were seriously considered. The cost of weatherproofing for outdoor construction, increased cost of maintenance, and variation in weather conditions finally caused the decision in favor of an indoor plant.

All of the company's existing plants require a large yearly amount of painting on inside and out.

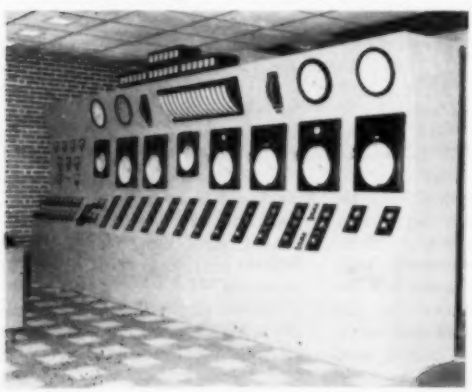


High pressure, barrel type, boiler feed pumps furnished by Byron Jackson Company. 500 gpm, 1600 psig, 3600 rpm.

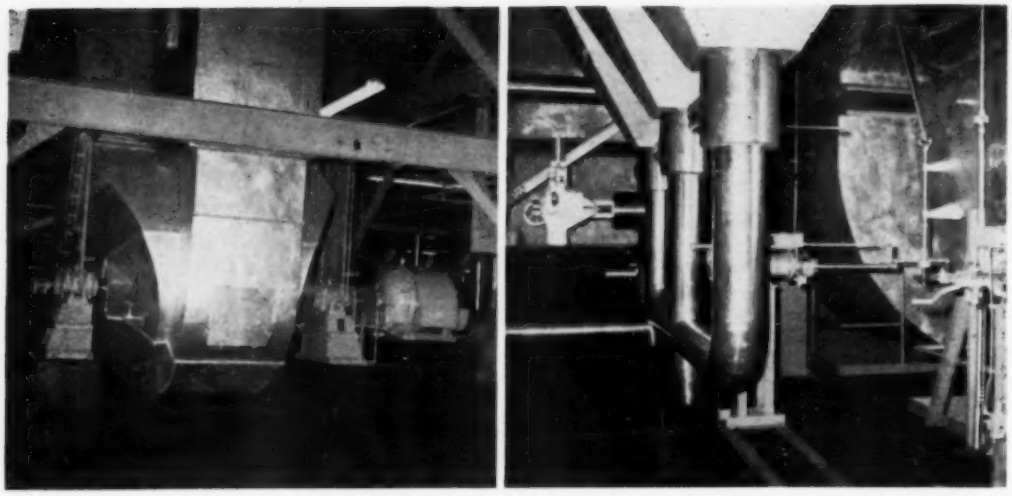
Checking available materials, the use of tile blocks seemed to provide the best construction. The cost of laying tile is much less than for brick due to size and weight and glazed surfaces could be obtained, eliminating the cost of yearly painting. Therefore, the walls are formed of buff, unglazed Dri Speedwall tile on the outside and buff, select quality, glazed tile for the inside surfaces. In order to lend a touch of color to the external appearance, the outside surface of the elevator shaft is No. 1751 Green, ceramic glazed tile with glass brick inserts. Most of the operating floors are covered with red quarry tile. It is believed that this will result in the minimum cost to maintain the appearance of the building.

The one-story section in the front of the building contains the offices, laboratory, machine shop, and assembly room. Adjacent to these, in the plant building, are the electric and instrument shops.

Boiler control panel in central control room.



Boiler front, showing six of nine burners.



The view at left shows one of two American Blower Corp., induced draft fans. At right the superheater hopper drains, the feedwater control valve, and the stream temperature control valve may be seen. Note the aluminum covering on pipe.

All rooms except the machine shop are air conditioned. A locker and shower room for operating and maintenance personnel is located on the ground floor on the south end of the building. The rest of this end of the building provides storage space for maintenance equipment and spare parts.

The oil unloading pump and booster oil pumps are in separate structures, located according to their service.

Boiler

In view of considerable trouble with existing boilers due to oil slag, it was decided to purchase a boiler with the minimum changes in direction of gas flow, and with spaces between tubes not less than 2 in.

The contract was awarded to the Babcock and Wilcox Company for one radiant-type boiler, operating at 1315 psig and 950 F total steam temperature, with a maximum capacity of 450,000 pounds per hour.

This boiler is equipped with 2 forced draft fans, 2 induced draft fans, and a tubular air heater in 2 sections so that 1 set of fans and air heater section can be taken out of service for cleaning without shutting down. It is possible to operate at 60 per cent of capacity on 1 set of fans.

The secondary superheater is of the pendant type and is located at the furnace outlet. The primary superheater and economizer are divided into 3 vertical sections separated by baffles and provided with dampers at the outlet for steam temperature control.

Numerous doors were installed to allow hand lacing if the accumulation of oil slag affects the boiler output or superheat. Special outside roller bearings with air space between ducts are provided on all dampers to eliminate the effect of temperature and flue gas.

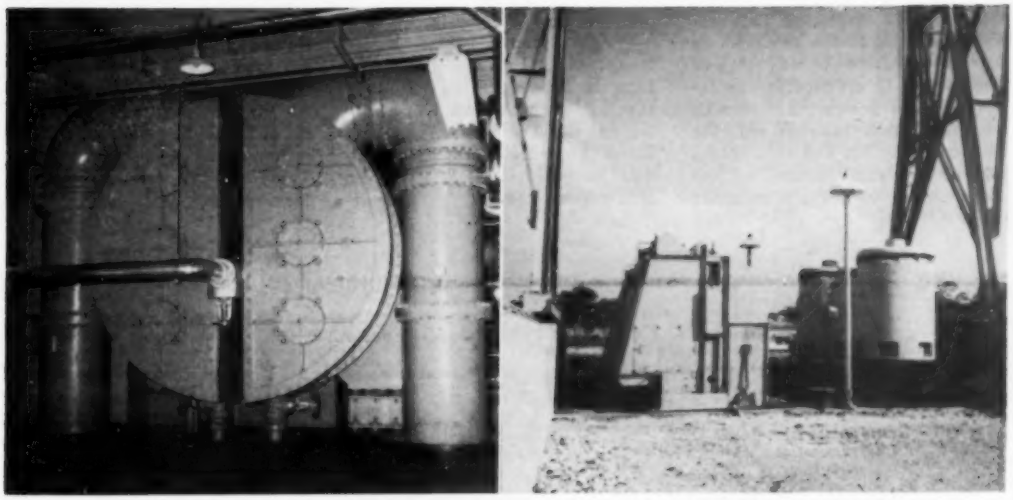
Automatic air puff soot blowers are located at points recommended. The retractable type (IK) was installed at all high temperature zones. Since there is practically an unlimited supply of steam for soot-blowing, steam is used as the blowing medium on all boiler and superheater sootblowers. An investigation had been made on the use of air or steam on these blowers and it was decided that there was not sufficient evidence that the results with air were better than steam to warrant the installation of sufficient air compressors to provide equivalent quantity of air. However, experience indicated that steam soot blowers could not be used satisfactorily in tubular air heaters on boilers burning heavy fuel oil, so air at 300 psig is used on the sootblowers in the air heaters. These sootblowers were located at the bottom of the last pass, since this is where the tubes start plugging.

Oil Burners

In order to save auxiliary steam, mechanical oil burners were installed. Since maximum range was desired, a return system was used with a supply pressure of 1000 psig. There are 9 burners and the few tests already conducted indicate that stable operation can be obtained with all burners from 90,000 pounds per hour to 440,000 pounds per hour output. No tests have been made below this rating.

On previous boilers, flexible steel hose has been used for connecting the burners to the oil header piping. This was not considered safe on oil at 1000 psig. A series of steel flexible couplings connected with steel piping provides means for moving the burners and eliminates possibility of bursting. On the basis of 7 months operation, the higher cost of this arrangement will be offset by low replacement cost as compared to the failure of steel hoses on the other boilers operating with lower oil pressures.

The booster pumps take oil from the large storage tank discharge at 95 psig. The oil is heated in the tank to approximately 105 F. From



At left—Outlet end of C. H. Wheeler condenser, showing discharge piping. Right—Revolving screens furnished by Link-Belt Co., and the Fairbanks-Morse Co., vertical condenser cooling water pumps.

the booster pumps, it goes through the G-fin oil service heaters, which raise it to 195 F. The oil enters the high pressure oil pumps at 65 psig and is discharged at 1050 psig. There are 2 full capacity high pressure pumps.

These pumps must be in a condition to be started from the remote control room, and some trouble was experienced with the heavy oil solidifying in the pump not in service. A small by-pass was provided on each pump to allow a minimum flow of hot oil through the spare pump at all times. Most of the burner return oil and excess oil at pump discharge is returned to the service heater suction to reduce auxiliary steam demand.

Turbo-generator

The General Electric Co. turbine has 3 rows of impulse blades and 21 rows of reaction blades. It has a capacity of 40,000 kw with 5 extraction points using steam at 1250 psig and 950 F total temperature and 2 in. Hg back pressure. Speed is 3600 rpm.

The generator has a capacity of 47,058 kva, or 40,000 kw at .85 power factor. It is hydrogen cooled, generating at 13,800 volts.

The direct connected exciter has a capacity of 145 kw at 250 volts, 580 amperes, and is shunt connected. A pilot exciter is also provided with a capacity of 4 kw.

Since the plant is located on salt water, and this introduces trouble from marine growth, external heat exchangers were provided. The hydrogen cooling system uses softened water in a closed cycle. This also includes the lubricating oil coolers. After passing through the oil coolers and hydrogen cooling coils in the generator, the water goes to 2 heat exchangers, using salt water as the cooling medium. Since each exchanger is sized for at least 60 per cent operation, it is possible to clean tubes whenever necessary.

Condenser and Circulating Water System

The condenser is vertically split, 32,500 square feet, single pass with 88½ per cent copper, 10 per cent nickel, and 1½ per cent iron tubes. There are 5930 tubes ⅞ OD by No. 18 BWG. They were purchased 6 in. longer than required to provide for inlet end erosion. Both inlet and outlet ends are packed and strainers are provided on the flared inlet ends to reduce erosion and have a slightly smaller entrance opening than tube diameter to eliminate solid objects such as shell from sticking in tubes. Observation indicates that no objects large enough to lodge in tubes go through the strainers. Magnesium anodes have been installed in the inlet and outlet water boxes to prevent graphitization. Duplicate twin steam air ejectors remove gases from the condenser with drains from the after condenser being dumped.

Two vertical propellor type pumps each having a capacity of 28,300 gpm are installed in concrete intake wells. Stop logs are provided so that each intake well can be dewatered without affecting the other one. Two traveling screens remove debris ahead of the pumps. The frames are alloy steel with stainless steel wire. This was done to eliminate galvanic action. Cathodic protection using rectifiers is also installed at the screens to protect iron surfaces and control barnacle growth on screens. A gantry crane with air operated hoist is provided to handle the steel stop logs and for removing screens or pumps for maintenance.

Feedwater Cycle

The condensate from the condenser is pumped by a full capacity condensate pump (2 installed) through the inter-after condensers and 19th stage, vertical extraction feedwater heater to the deaerator. Since the system make-up is supplied to the deaerator by an evaporator, a float control valve maintains deaerator level, which forces the excess condensate from the

condenser to a surge tank. This provides a floating control on deaerator level. Steam from the 16th stage of the turbine is supplied to the deaerator, and pressure varies with load. Automatic pressure reducing valves on the 8th and 13th stages provides heating steam to the deaerator at low loads to maintain the pressure above 4 psig.

Three Byron Jackson barrel type, feedwater pumps take water from the deaerator. Two pumps are adequate for maximum boiler rating, and the other serves as a spare. These pumps are double volute type with inter-volute case of 4 to 6 per cent chrome alloy steel and rotating element of 11.5 to 13 per cent chrome alloy steel as protection against corrosion and erosion.

Recirculation of boiler salines to the deaerator storage maintains pH of 8.6 in the feedwater for protection to corrosion in piping, etc. The evaporator operates on steam from the 13th stage.

PRINCIPAL EQUIPMENT—A. W. Higgins Plant

GENERAL DATA

Name of Station ..... A. W. Higgins
Station Site ..... Oldsmar, Florida
Total Generating Capacity ..... 40,000 kw
Total Boiler Capacity ..... 450,000 lb per hr at 1250 psi and 950 F.
Cooling Water Source ..... Tampa Bay
Design Engineers ..... Kuljian Corporation
General Contractor ..... Kuljian Corporation

TURBINE-GENERATOR

Turbine ..... One—General Electric Co., 40,000 kw, 3600 rpm, 1250 psi, 950 F.
Generator ..... One—General Electric Co., 40,000 kw, 47,058 kva, .85 pf, 13,800 volt, 3 phase, hydrogen cooled.
Exciter ..... One—General Electric Co., 250 v, 145 kw, 3600 rpm.
Heat Exchanger ..... One—Griscom-Russell Co., on hydrogen cooling system. Divided waterbox, shell and tube, 5033 sq ft.
Turbine Oil Coolers ..... Two—Andale Mfg. Co., shell and tube.
Turbine Oil Filters ..... One—Bowser Inc., 270 gph, 3000 gal.

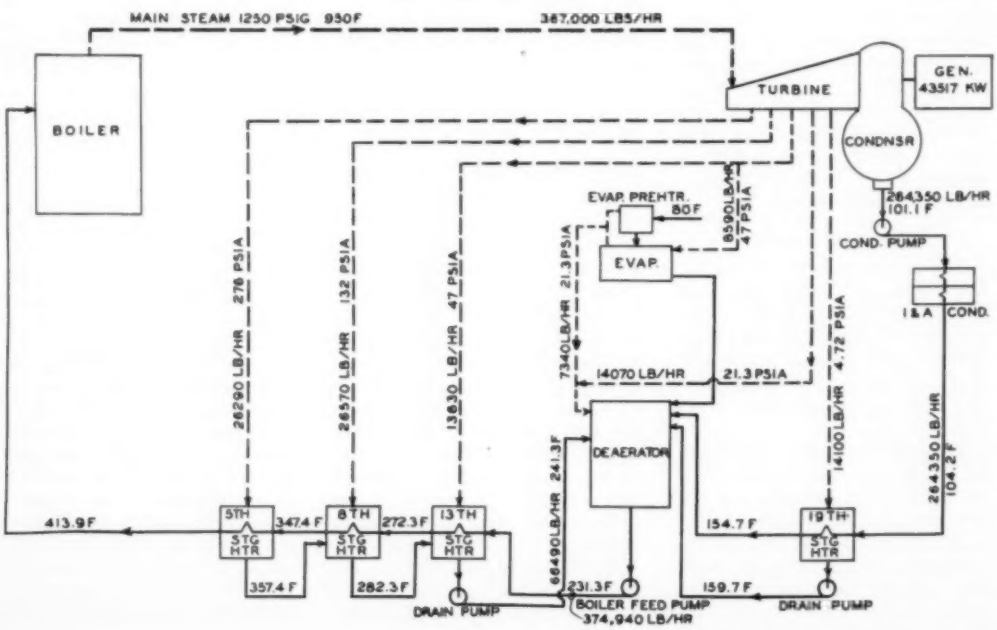
CONDENSING EQUIPMENT

Condenser ..... One—C. H. Wheeler Mfg. Co., spring supported, single pass divided waterbox; surface 32,500 sq ft, ¾" O.D. tubes 88¼% copper, 10% nickel, 1½% iron, packed on both ends.
Circulating Pumps ..... Two—Fairbanks-Morse Co., vertical propellor, 28,300 gpm; driven by G-E motor, 125 hp, 450 rpm, 2300 v, totally enclosed induction.
Condensate Pumps ..... Two—C. H. Wheeler Mfg., Co. horizontal 2 stage split casing, 600 gpm at 225 ft head; driven by G-E motor, 60 hp, 1200 rpm, 440 v, splash proof induction.
Air Removal Equipment ..... C. H. Wheeler Mfg. Co., twin 2 stage steam.
Priming Ejectors ..... One—C. H. Wheeler Mfg. Co., single stage.
Expansion Joints ..... U. S. Rubber Co. (rubber); Zallea Brothers (copper).
Screen Wash Pump ..... One—Allis-Chalmers Mfg. Co., 330 gpm, salt water at 172 ft head.
Traveling Screens ..... Two—Link Belt Co., 30,000 gpm, 8' 6" trays, stainless steel cloths; driven by G-E motor, 1 hp, 1800 rpm, 440 v, totally enclosed induction, speed reducer.
Switchboard and Control Panels .. General Electric Co.

STEAM GENERATING EQUIPMENT

Boiler ..... One—Babcock & Wilcox Co., radiant type, 450,000 lb per hr maximum, 390,000 lb per hr normal, 1315 psi operating, 1450 psi design. Single drum, 60" dia x 24' long.
Economizer ..... One—Babcock & Wilcox Co., continuous type, counter flow, 3 section, 10,900 sq ft heating surface.
Superheaters ..... Babcock & Wilcox Co., pendant—2 section, 16,122 sq ft surface, 950 F.
Furnaces ..... One—Babcock & Wilcox Co., complete water walls, 5816 sq ft heating surface.

Heat balance flow diagram.



Three closed vertical heaters follow the feedwater pumps. These heaters take steam from the 13th, 8th, and 5th stages respectively. They are equipped with desuperheating section, condensing section, and subcooling section. The drains are cascaded to the next lower heater with the 13th stage heater drains pumped to the deaerator if the pressure is not sufficient. The 19th stage heater drains are normally pumped to the deaerator, but an automatic drainer valve will discharge these drains to the condenser in case of pump failure. The feedwater then enters the economizer through the feedwater valve.

All of the piping which requires insulation due to temperature has an external covering of sheet aluminum. In previous plants, a canvas covering was used, either sewed or pasted. The canvas required initial sizing and painting, and additional painting had to be done over the years to maintain appearance. This

Florida Power Corporation, St. Petersburg, Florida

Air Heaters ..... Two—Babcock & Wilcox Co., 2 gas pass tubular, 96,600 sq ft heating surface, 124,200 cfm, 80 F inlet, outlet 610 F.
Soot Blowers ..... Diamond Power Specialty Corp., Automatic Sequention 71K, 2A2E and 2 straight line air and steam.
Blow-Off Valves ..... Five—Yarnall Waring Co., 1½"
Water Columns ..... Two—Diamond Power Specialty Corp.
Safety Valves ..... Three—Foster Engineering
Burners ..... Nine—Babcock & Wilcox Co., high pressure mechanical return system.
Combustion Control ..... Republic Flow Meters, Inc.
Fuel Oil Pumps ..... Two—De Laval Steam Turbine Co., 75 gpm at 1100 psig.
Fuel Oil Heaters ..... Five — Griscom-Russell Co., fin type sections 4 high, 90 gpm from 100 F to 250 F, 150 psi.
Oil Unloading Pump ..... One—Kinney Mfg. Co., 1000 gpm; 150 psig discharge; driven by G-E motor, 150 hp with speed reducer, 1770 rpm, 440 v, open squirrel cage.
Oil Booster Pumps ..... Two—Kinney Mfg. Co., capacity 80 gpm, 65 psig discharge; driven by G-E motor 7½ hp, 230 rpm, splash proof gear.
Burner Light Oil Pump ..... One—De Laval Steam Turbine Co., capacity 15 gpm, 250 psig discharge; driven by G-E motor, 5 hp, 1750 rpm, splash proof.
Heavy Oil Storage Tank ..... One—Chicago Bridge & Iron Co., capacity 55,000 barrels.
Light Oil Storage Tank ..... One—Johnstone Brothers Fuel Co., capacity 16,000 gal.

DRAFT EQUIPMENT

Stacks ..... R. D. Cole Mfg. Co., steel, self-supporting, 13' 6" dia, 50' high.
Smoke Breeching ..... Connery Construction Co.
Forced Draft Fans ..... Two — American Blower Corp., 62,100 cfm, 8.3 in. water 80 F, vane controlled; driven by G-E motor, 250 hp, 720 rpm, 2300 v, splash proof induction.
Induced Draft Fans ..... Two — American Blower Corp., 105,000 cfm, 6" water 250 F, inlet damper controlled; driven by G-E motor, 300 hp, 720 rpm, 2300 v, splash proof induction.
Air Ducts ..... Connery Construction Co.
Draft Gages ..... Republic Flow Meters Co.
Draft Control ..... Republic Flow Meters Co., manual and automatic air actuated.

BOILER FEEDWATER EQUIPMENT

Boiler Feed Pumps ..... Three—Byron Jackson Co., double barrel volute, 500 gpm, 1600 psig, 3600 rpm; driven by G-E motor, 600 hp, 3600 rpm, 2300 v splash proof induction. Minimum flow by-pass control—Republic Flow Meters Co., automatic air actuated valves.
Bleeder Heaters ..... Four—Griscom-Russell Co., turbine extraction, vertical W-tube:

Fifth Stage—Integral desuperheater and subcooling zones, closed type, vertical U-tube, 2715 sq ft effective heating surface, raises 374,940 lb per hr water from 347.4 F to 412.9 F, 400 psig shell pressure, 1800 psig tube pressure 70-30 cupro-nickel tubes.

Eighth Stage—Integral desuperheater and subcooling zones, closed type, vertical U-tube, 2520 sq ft effective heating surface, raises 374,940 lb per hr water from 272.3 F to 347.4 F, 190 psig shell pressure, 1800 psig tube pressure, 70-30 cupro-nickel tubes.

Thirteenth Stage—Integral desuperheater and subcooling zones, closed type, vertical U-tube, 1650 sq ft effective heating surface, raises 274,940 lb per hr water from 231.2 F to 272.3 F, 60 psig shell pressure, 1800 psig tube pressure, 70-30 cupro-nickel tubes.

Nineteenth Stage—Vertical, closed type, U-tube 1020 sq ft effective heating surface, raises 264,300 lb per hr water from 104.2 F to 154.7 F, 80 psig shell pressure, 1800 psig tube pressure, Admiralty tubes.

Deaerating Heaters ..... One—Cochrane Corp., horizontal tray, capacity 450,000, ten minute storage.
Feedwater Regulators ..... Republic Flow Meters Co., automatic 3 element, by-pass, remote air operated.
Heater Feed Pumps ..... Three—Allis-Chalmers Mfg. Co., type close coupled.
Evaporator ..... One—Griscom-Russell Co., 9000 lb per hr, horizontal bent tube—327 sq ft surface

WATER TREATING PLANT EQUIPMENT

Softening Plant ..... Two—Permutit Co., sodium zeolite, 17 gpm each.
Chemical Feed Pumps ..... Two—Milton Roy Co.: 1 Duplex 78 gpm per cylinder adjustable, 2000 psig discharge for boiler treatment; 1 simplex 2 gph adjustable 20 psig discharge for sodium sulphite treatment.

PIPE AND PIPE COVERING

Piping Contractor ..... National Valve & Mfg. Co.
Steam Header ..... Chrome-moly—Sch 160-16".
High and Low Pressure Valves ... Manning, Maxwell & Moore; Reading, Pratt & Cady; Grinnel Co.; William Powell Co.; Chapman Valve Mfg. Co.
Pressure-Reducing Valves ..... Fisher Governor Co.
Small Valves ..... Hancock Valve Co.
Reverse Flow Valves ..... Atwood & Morrill
Automatic Relief Valves ..... Manning, Maxwell & Moore; Fisher Governor Co.; J. E. Lonergan Co.
Float Chambers and Floats ..... Fisher Governor Co.
Drainage Control:
Traps ..... Armstrong
Drainers ..... Fisher Governor Co.
Pipe Covering Contractor ..... The Aber Company.
Unibestos with aluminum covering.

INSTRUMENTS

Boiler Meters ..... One—Republic Flow Meters Co.
Feedwater Flow Meters ..... One—Republic Flow Meters Co., electric.
Draft Gages ..... Two—Republic Flow Meters Co., drg.
Pressure Gages:
Indicating ..... Manning, Maxwell & Moore.
Recording ..... Republic Flow Meters Co.
Vacuum Gages ..... Manning, Maxwell & Moore.
Mercury Columns ..... Manning, Maxwell & Moore.
Thermometers:
Indicating ..... Manning, Maxwell & Moore.
Recording ..... Republic Flow Meters Co.; Foxboro Instrument Co.
Condensate Conductivity Recorder Foxboro Instrument Co., electronic.
O_2 Recorder ..... The Hays Corporation.
Barometer ..... Manning, Maxwell & Moore.
Plant Water Meter ..... Trident, turbine meter.

ELECTRICAL EQUIPMENT

Main Transformers ..... Four—General Electric Co., 13.2 kv to 115 kv.
Auxiliary Transformers ..... Two—General Electric Co., 1-13.2 kv to 2.4 kv; 1-2.4 kv to 440 v.
Standby Auxiliary Transformers .. Two—General Electric Co., 1-13.2 kv to 2.4 kv; 1-2.4 kv to 440 v.
Oil Circuit Breakers and Disconnects ..... General Electric Co.
Grounding Switches and Choke Coils ..... General Electric Co.
Direct Current Control Power ..... Electric Storage Battery Co. (Exide) storage battery; 125 volt wet type—60 cells.
Battery Charger ..... Two—Electric Products Co.

MISCELLANEOUS

House Service Pumps ..... Two—Allis-Chalmers Mfg. Co.
Surge Tanks ..... One—Coastal Steel Construction Co.
Air Compressors—Instrument .... Two—Pennsylvania Pump & Compressor Co., single stage, double acting, horizontal, 79 cfm at 100 psig, motor driven.
Air Compressors—Soot Blowers ... Two—Pennsylvania Pump & Compressor Co., 2 stage tandem double acting, horizontal, 184 cfm, 350 psig after coolers.
Air Compressors—House ..... One — Pennsylvania Pump and Compressor Co., single stage, double acting, horizontal, 215 cfm, 100 psig.
Turbine Room Crane ..... Manning, Maxwell & Moore 100-ton—20-ton auxiliary.
Gantry Crane ..... One—Industrial Equipment Co., 10-ton.
Water Tanks ..... One—Chicago Bridge & Iron Co., 1,000,000 gal.
Motor Drive Couplings ..... Fast's (Koppers Co.)
Structural Steel ..... O'Neal Steel Works Co.
Piling ..... Raymond Concrete Pile Co.
Concrete Work ..... R. E. Clarson, Inc.
Masonry Work ..... National Fireproofing Corp.
Electrical Installation ..... Cleveland Electric Co.
Passenger and Freight Elevator .. Otis Elevator Co.
Plumbing and Heating ..... Jones, Inc.

aluminum covering eliminates painting, reduces time required on pipe changes, and always presents a clean polished surface.

Service Water

A test well was sunk approximately 1600 feet, but due to the proximity of salt water, a supply of acceptable water was not obtained. Since the water main of the St. Petersburg water supply ran within 3 miles of the plant, a 4 in. transite pipe line was installed to connect the plant to this supply. An auxiliary pumping station was provided at the main in case of low pressure. A 1,000,000 gallon storage tank was installed at the plant to provide at least 30 days' requirement and protect against failure of supply.

This city water is already partially softened, but zeolite softeners had to be provided at the power plant to reduce the hardness to a satisfactory value. These softeners discharge into a concrete low level well of 27,000 gallon capacity.

Central Control Room

In order to reduce plant operating personnel to a minimum and to provide maximum supervision of equipment, practically all operation can be handled from the central control room. This room is located between boiler and turbine on the operating level and is air conditioned and sound proofed.

The boiler and turbine panels are specially shaped according to operators' ideas for ease of operation and observation. All necessary instruments are provided on the boiler panel for operating the boiler manually. Besides this, automatic control is provided on boiler water level, combustion control, and steam temperature control. A pH recorder on deaerator storage water as well as a remote controller allows the boiler operator to govern the amount of boiler water recirculation to the deaerator.

The turbine panel contains the necessary turbine instruments and an 80 point Speedomax indicator for obtaining any necessary temperature readings from steam temperature to bearing oil temperature and condensate temperature.

A separate section on both of these panels contains all electric switches. This was done to separate electrical control equipment from mechanical for ease in installation and maintenance. A complete annunciator system is included with indicators located on top of their respective panels.

These 2 panels face each other. Across the end of the room, an electrical panel is provided containing all instruments for control of transmission and auxiliary plant supply. Provision was made for future expansion when 3 units will be in operation.

Electrical Equipment

The power generated at 13.8 kv is carried to the step-up transformer bank through an isolated-phase metal-enclosed bus duct, rated at 15,000 volts, 3,000 amperes with a momentary rating of 130,000 rms amperes. Four transformers are provided in cells, one being an unconnected spare.

Each transformer is single phase, oil immersed, rated at 14,667/18,330 kva self-cooled or forced air cooled, 115,000 volts grounded wye to 13,200 volts delta. They are equipped with flanged wheels and mounted on tracks. Five voltage taps of 2½ per cent rated kva are provided. Two transfer trucks and the necessary rails are installed to facilitate removal of these transformers.

An air blast circuit breaker, 15,000 volts, 3,000 amperes, 1,000 kva interrupting capacity is connected in the generator bus run between the generator and the transformer bank.

Each generator neutral lead is provided with two bushing type current transformers, 3000/5 amperes for metering and relay. The leads are then bussed together and connected through a single pole disconnect switch to a grounding transformer. This transformer is oil immersed 50 kva, 13,200-240/120 volts, the secondary being connected to a 600/5 ampere current transformer and resistor to provide an alarm in the control room in case of a ground fault.

A 3750 kva, 13,200/2400 volt transformer is connected to the generator bus on the generator side of the breaker to supply auxiliary power for the 2300 volt motors.

Duplicate transformers supply low voltage current to auxiliaries. They are three-phase, askarel filled, 1000 kva, self-cooled, 2400 volts delta to 480 volts delta with two 2½ per cent rated kva taps above and a like number below 2400 volts.

All auxiliaries in the plant are electrical. The motors, 75 hp and larger, are 2300 volt and each is connected to an individual circuit breaker. All of the 2300 volt switch gear is metal clad with drawout type air circuit breakers.

The small motors are connected to individual electrically operated circuit breakers on the 440 volt switch gear.

Some of the smaller 440 volt motors are connected to a combination magnetic starter with circuit breaker located near these motors.

Station lighting is normally provided by two dry type 100 kva, 3 phase, 480 volts delta to 120/208 volts grounded wye transformers. In case of failure, emergency lights located at all essential parts of the plant are automatically switched on.

A battery room containing a 60 cell battery rated at 564 amperes for one minute down to 1.75 volts per cell and a 12-hour discharge rate of 43.2 amperes is provided for control power.

Nineteen telephones of the automatic dial type are located at essential locations for plant intercommunication.

Results

The design of the plant indicated that a 4-man shift could operate it normally. Based on the experience obtained since the start of operation in June, 1951, it appears that this is true with the possible exception of unloading oil. Two or three helpers are included in the shift operating personnel at the present time for training.

The average heat rate for the last 2 months has been about 10,900 Btu per net kwh. There are still some changes to be made which should result in a slight improvement. In view of maximum output being required during the day, and night loads dropping as low as 25,000 kw, it is believed that results are being maintained about as close to theoretical heat rate as can be expected.

Mole's-Eye Viewpoint Helps
Engineers Solve Erection Problem

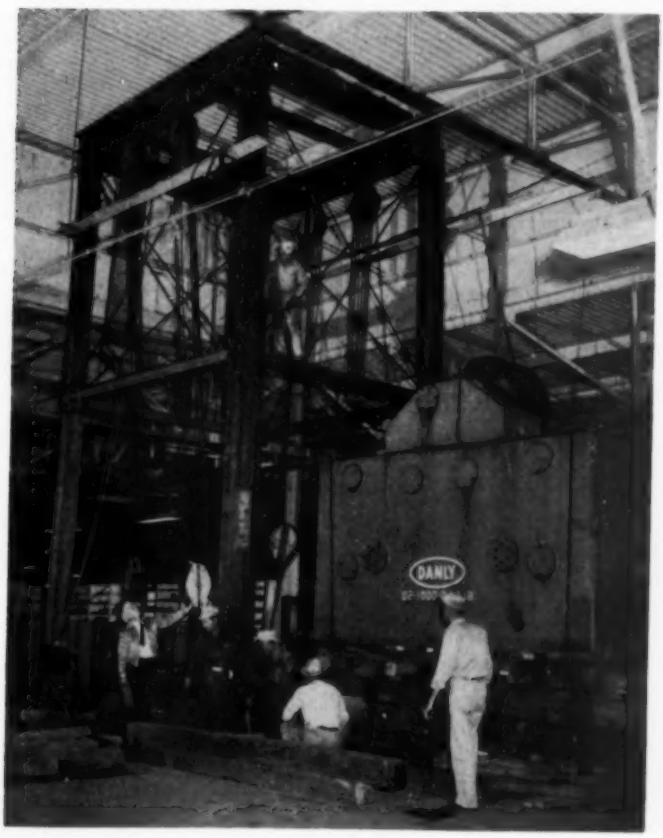
Unable to go up without raising the roof, TEMCO engineers reversed the field and went down.

WHAT started out as the simple installation of another piece of equipment ended up as a major engineering feat when Texas Engineering and Manufacturing Company, Inc., Dallas, Texas, received a 1,000 ton Danly mechanical double action forming press under its Navy facility contract which is making the TEMCO plant one of the best equipped aircraft manufacturing facilities in the United States.

The problem was how to get the giant press which weighed over two hundred thousand pounds and stood over 30 feet high into an area with an overhead clearance of a little over 33 feet, and do it without disturbing production operations just eight feet away. Normally, when one of these presses is installed, the three sections are assembled one on top of the other with giant cranes, and four tie-bolts 25 feet long and six inches in diameter are dropped in from the top to clamp them together. Following this procedure in the TEMCO installation would, however, have meant removing a large section of the roof which not only would have been an extremely costly undertaking, but also would have meant exposing adjacent factory areas to inclement weather and loss of heat for the duration of the installation operation.

Unable to go up without raising the roof, the TEMCO engineers reversed their field and went down. Four foundation pier holes 25 feet deep were bored into the ground, and after attaching eye-bolts to the upper ends of the 25-foot tie-bolts, the tie bolts were lowered into these holes. Then the bottom section of the press was placed on the foundation.

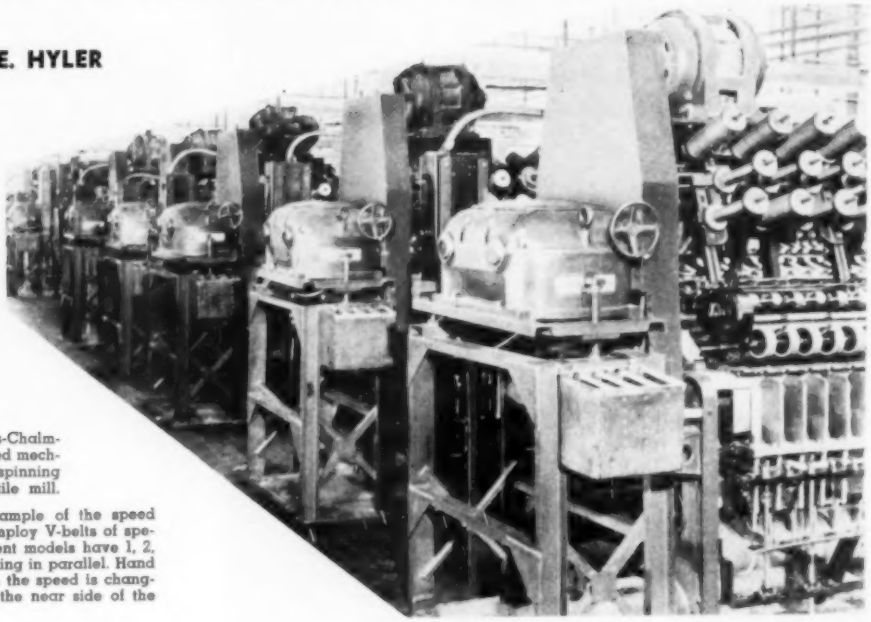
Step number two was the erection of a gallows 33 feet high and built out of 14-inch steel H-columns. Then next, using the lower section of the press as a base, the top section of the press, which itself weighs 60 tons, was slid into place over the bottom section and then raised inside the gallows frame by jacking, cribbing and hoisting. After the top section had been raised 11 ft, the center section was slid into place between the top and base section. Then cables were attached to the eye-bolts in the ends of the tie bolts, and the tie-bolts were threaded up through the press to clamp the three sections together.



The sixty ton top section of a 1,000 ton Danly double-action mechanical forming press is slid into place for raising at Texas Engineering and Manufacturing Company, Inc., Dallas, Texas. Unique erection methods evolved by TEMCO industrial engineers cut erection time by two weeks and avoided necessity for removing any part of building roof.

Mechanical Variable Speed Drives

By JOHN E. HYLER



A group of Allis-Chalmers variable speed mechanisms serving spinning frames in a textile mill.

This is an example of the speed changers that employ V-belts of special type. Different models have 1, 2, 3 or 4 belts, running in parallel. Hand wheels by which the speed is changed are seen on the near side of the units.

Several methods of providing variable speed through mechanical means are explained, and illustrations of practical applications of each type are presented.

ABILITY to vary rotary speed delivered to a machine or mechanism by a drive is a highly important element in power transmission. Variable speed is involved in many different phases of production, and is essential to industry. Several different kinds of mechanical variable speed mechanisms have evolved, and different advantages are presented by each type.

Beveled Discs and Belt

One efficient means of varying speed, so that speed on the driving element will be constant, and that on the driven element variable to suit the case in hand, employs a composite pulley made up of two cone-faced discs. Both discs are mounted on a common shaft, facing each other. Thus, the two discs provide a V-form track between them, in which a belt with V-form edges can be run.

The cone-faced discs are so arranged on the shaft that they can be drawn farther apart or closer together. As they are drawn closer together, the running belt is caused to move to a larger effective diameter.

Two sets of discs of this general type are mounted on two parallel shafts. As the pair of discs is drawn farther apart on one of the shafts, the pair of discs on the other shaft is drawn proportionally closer together, so that the belt is kept in proper tension all the while. Thus, as the discs on the constant speed input shaft are drawn farther apart and those on the output shaft are drawn closer together —the speed of the output shaft is reduced.

Some variable speed mechanisms of this general type employ a belt of considerable width. In order that this relatively wide belt may have sufficient transverse strength to withstand compression exerted on it widthwise, it is made up of a series of wood cleats fastened to a flat canvas belt.

The wood cleats are slightly longer than the width of the belt to provide room for beveled ends corresponding to the angle between the running discs which they engage.

In some cases, the beveled ends of the wooden cleats are covered with caps or tips of some material providing good traction against the cone-faced discs. Means are provided for expanding the discs on one shaft, and contracting those on the other a proportionate amount,

either manually or otherwise, in order to change the speed of the driven machine.

Where desirable, speed of a device of this type may be controlled remotely. In this case, a motor is employed to turn the shifting screw, and the motor is actuated by closing a circuit controlled by a push button.

It is also possible to apply automatic mechanical control to variable speed mechanisms of this type, in which case the regular shifting screw and nuts are replaced by an extended lever to which the automatic control impulse is transmitted.

Multiple V-Belts

Other variable speed mechanisms employ the same general principle of expanding and contracting cone-faced discs, but instead of using belts with cross cleats of wood, they employ V-belts made in much the same manner as standard power transmission V-belts. The belts employed, however, are even in this case considerably wider than standard V-belts. Some of these speed-changing devices use only one V-belt of this kind. Others are designed with 2, 3, or 4 V-belts running in parallel on two sets of composite, expandable-and-contractible pulleys arranged on two parallel shafts.

This is made possible through a mechanism by which the 2, 3, or 4 V-belts mentioned may be kept running in parallelism, and the respective composite pulleys on which they run may be separated or closed together a uniform amount. While this design does not allow quite so great a speed range as the one previously mentioned, it nevertheless provides all the speed change necessary in countless cases, and has been engineered to fill a definite need. It provides a range of power transmission speeds as high as 375 per cent at low cost.

These mechanisms are fully enclosed and the input and output shafts may be extended on either side of the case.

Double Step Changes

It is possible to provide two interconnected speed changing mechanisms of this type within a single transmission case. The output shaft of this double transmission is in alignment with the input shaft.

Like other variable speed mechanisms of this general type, models are available with the transmission belts running either horizontally or vertically. Considering the vertical type of mechanism, the input and output shafts are located near the bottom of the transmission case, and a jack-shaft is located near the top. One V-belt runs from an expansible pulley on the short input shaft to a similar pulley on the top or jack-shaft. Another V-belt of special type runs from a second expansible pulley on the jack-shaft to another expansible pulley on the short output shaft, located at the bottom of the case.

Incorporation of two steps in the speed changing apparatus of this device permits obtaining greater variation in speed than one step can usually provide.

Drives of the lower horsepower ratings are usually adjustable over a greater speed range than the larger units. Units which will transmit as much as 15 horsepower are available, and provide a speed range as great as 6 to 1, whereas units transmitting fractional horsepower may provide speed variations as great as 16 to 1.

Grooved Discs and Chain

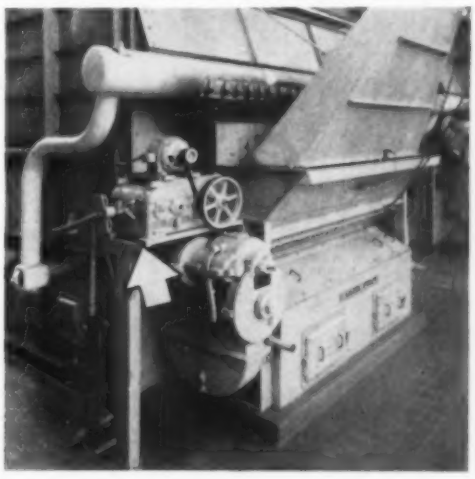
Another variable speed mechanism of the expansible-and-contractible pulley type, instead of using V-form belts makes use of a special power transmission chain. In this case, the cone-type faces of

This variable speed mechanism furnished by Worthington Pump and Machinery Corp. is mounted with the driving motor attached to the input shaft.

Drives of this type have a short input shaft, a jack-shaft, and a short output shaft, the input and output shafts in line. Speed change is effected in two steps.

These stokers in the Frank Fehr Brewing Company at Louisville have their speed controlled by Reeves Pulley Company transmission. The transmission, in turn, is controlled by a Hagan regulator.

Variable speed mechanisms of this general type make use of a relatively wide belt with cross cleats of wood.



the discs are machined with grooves extending radially from the center of the disc to the rim. These grooves are tapered in such degree that the amount of metal left standing between them is also tapered. A highly ingenious design of self-forming and self- pitching chain is used in the device. This special chain accommodates itself to the grooves and the teeth on the cone-faced wheels.

The principle of this unit is similar to the others described, with the exception that the chain provides a positive drive. These units are totally enclosed, and run in an oil bath. Like others mentioned, they incorporate a control screw and handwheel where manually controlled, and may also be provided with a lever type control, remote mechanical control, or remote control by electrical means. A vernier control is provided for use where extremely fine speed adjustment is desired.

Such speed controls are sometimes used for synchronizing the speeds of two or more machines, or for making adjustments needed because of shrinkage and expansion of materials being processed, etc. The control of feeders on weighing and filling machines, and the control of the uniformity of many products is obtained by means of a vernier control on a device of this nature. Some units of this type provide a speed range as wide as 6 to 1.

Differential Mechanism

The self-pitching chain and disc type of mechanism is sometimes used in combination with a mechanical differential mechanism to extend the overall ratio of control, and the differential mechanism receives its power from the output shaft of the other mechanism.

This type of composite variable speed drive is available in many different models. Due to incorporation of the mechanical differential mechanism, output speed may actually be reduced to zero—the driving motor and the transmission both running, but the output shaft standing still. From a minimum speed of zero, maximum output speed on some of these models extends into the high speed range.

Some models of these transmissions provide 50% and others 200% torque at zero speed, and one can be selected to best suit given requirements. This type of control is especially valuable in processes which involve continuous movement of products in the form of flat widths, as for instance in the manufacture and treatment of textiles, paper, steel strip, etc.

Variable speed transmissions of this type meet requirements for exceedingly delicate speed variations. These are applied in industrial operations where material being processed may either shrink or stretch. The variation consequent to shrinkage or stretching may be very small, or it may be comparatively large. In order to take care of this slight change in length from one end of such a process to another, a positive transmission with an indicating dial is required, and accuracy to a fraction of 1 per cent may be necessary.

Modified variable-speed transmissions of the type mentioned have been provided which have an extremely narrow speed range, but which are capable of being adjusted with very great accuracy. Their entire range may be as low as 2 per cent, depending on the size of the unit. For instance, if a variable speed transmission of this type is placed between two shafts, where the input shaft is running at 100 rpm, the output shaft can be made to run accurately at any point from 990 to 1010 rpm. Thus, the very small amount of acceleration or deceleration of the output shaft required for purposes such as those cited may readily be provided.

Internal Rollers

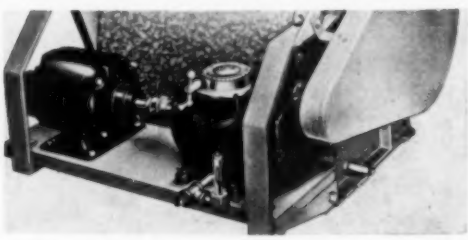
Some variable speed mechanisms employ internal rolling members for making speed changes as desired. Mechanisms with internal rolling members function as speed

This drive shown at left contains specially contoured rolls through which the speed change is effected. The Stephens-Adamson unit is shown driving a screw feeder in a paper mill. Speed changes are controlled from below by the sprocket and chain.

These mechanisms are equipped with a central full-floating shaft, and specially contoured rollers bear against inner and outer races to provide speed changes.

The unit shown below is a special feeder for flour, feeds, and cereals. The Graham Transmission, Inc. variable speed mechanism seen at the right provides controlled speed range from zero to maximum.

This device effects its speed change through straight tapered rollers operating in contact with a non-rotating ring.



reducers as well as variable speed devices. Consequently, they are very well suited for coupling direct to a high speed motor shaft.

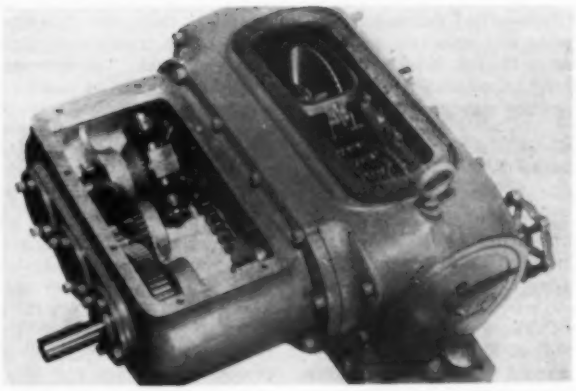
One variable speed mechanism of this particular type has its output or variable speed shaft in alignment with its high speed input shaft. These two shafts are held at two ends of the same housing, and the drive is very compact.

A full-floating center shaft, between the input and output shafts, carries two inner races which are secured with feather keys—allowing individual longitudinal movement of those races.

The full-floating center shaft receives rotary motion from the high speed input shaft by means of a compensating coupling. The inner races, which are held on the center shaft, also have longitudinal movement, and are pressed toward one another by powerful springs. They engage three specially contoured planetary rollers, causing these rollers to revolve. As the planetary rollers revolve, they contact fixed outer races. This causes them to rotate around the center shaft in a planetary manner. Three rollers are held on proper spacing by means of a spider to which they are connected through individual yokes. The planetary rotation of the rollers transmits rotary power to this spider. The spider, in turn, is rigidly keyed to the variable speed shaft.

The rollers which transmit power from the center shaft to the variable speed shaft are of varying diameter. The arrangement is such that the outer races may have their positions changed longitudinally, relative to one another and to the rollers. As the positions of the outer races are changed, the relative point of contact between the outer races and the planetary rollers is altered, thus providing contact on a progressively larger or progressively smaller diameter on the rollers, depending on the direction of the adjustment. This adjustment is made by a handwheel surrounding the high speed input shaft.

As the two outer races are drawn closer together, they make their contact with the specially formed planetary rollers at a point near their maximum diameter. Simultaneously, there is a reverse motion of the inner races, which draw apart proportionately, thereby contacting the planetary rollers at their small diameters. On the other hand, when the outer races are drawn apart, they contact the rollers on their smaller diameters, and the inner races contact the rollers on their larger diameters. Thus, a progressive speed change anywhere within the scope of the device may readily be obtained.



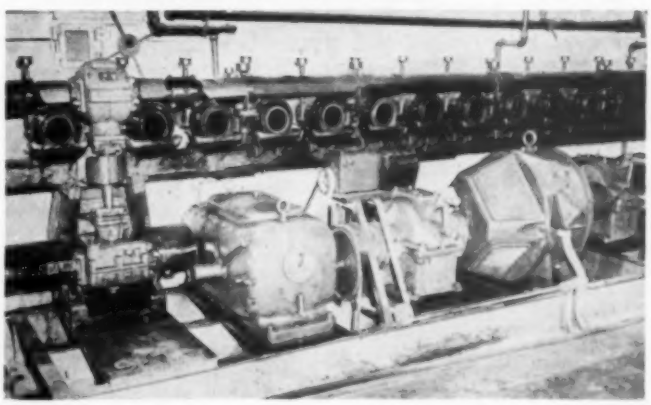
Mention was made in the text of a composite variable speed setup, in which a variable speed mechanism of the type having a self-forming and self-pitching chain is combined with another mechanism incorporating a mechanical differential. The variable speed mechanism incorporating the self-pitching chain is here seen with its top open, at the right.

The differential mechanism supplied by Speed Control Corp. is seen at the left. Output speeds varying from maximum to zero may be obtained with this unit.

On variable speed mechanisms of this type, maximum speed available from the variable speed shaft is usually not much more than half that of the high speed input shaft, but is dependent somewhat on the amount of horsepower being handled. For units of 3 to 6 hp, with a motor input speed of 1800 rpm, the variable speed range available will be from a minimum of 180 to a maximum of 800 rpm. The range is greater as the amount of horse-

In making drawn sheet glass, the drawing machine and annealing lehr must be kept in time, to avoid deformation of the plastic sheet of glass. In the application shown, the Link-Belt Company variable speed drive, at the left, is used in driving the lehr rolls, the speed of which are calibrated to agree with speed of the drawing machine.

Expansible and contractible grooved discs operate in mesh with a chain having self-forming and self-pitching characteristics.



power transmitted decreases. For instance, still considering an 1800 rpm input, the minimum speed deliverable by the device is about 200 rpm, and the maximum about 1000 rpm.

Tapered Roller Differential

There are other variable speed transmissions which make use of rolling members, but which operate on a radically different principle. One type makes use of straight tapered rollers as speed changing devices. These transmissions have the great advantage that they provide a speed range anywhere from maximum to zero.

In addition, such transmissions may readily be reversed, simply by reversing the motor. There are also mechanically reversing units, which will deliver equal speeds both forward and reverse without changing input rotation. On these, however, maximum speed both forward and reverse is only 60% of the maximum speed available on a non-reversing unit. Units of this type are often built as a straight-line extension of an induction motor.

This type of variable speed device uses the familiar compound planetary gear principle, with the exception that the non-rotating member is a traction ring instead of a ring gear. The non-rotating traction ring engages tapered rollers at varying diameters. In order to make this possible, the non-rotating ring is moved lengthwise of the transmission, to engage the rollers mentioned at varying diameters. The straight-tapered rollers are supported in a carrier, and are inclined at such an angle that their outer edge (or elemental line) is held parallel to the central axis. Plenty of traction pressure between the rollers and the ring is obtained through the simple fact that the rollers are held outward through centrifugal force during their rotation, pressing outwardly against the ring.

The output shaft on this device is made integral with a special cup-type ring gear which is turned inward to face the ends of the tapered rollers. The end of each tapered roller is fitted with a small pinion, beveled sufficiently to compensate for the amount the axis of the roller departs from parallelism with the central axis of the transmission. The slightly beveled gears or pinions move with the carrier in which they are held. Consequently, they turn at constant motor speed around the central axis. Because they roll against the outer stationary control ring, however, the rollers and the pinions must at the same time also turn their own axis in the opposite direction.

This turning in the opposite direction is at a variable speed, which is always equal to motor speed times the ratio between the control ring diameter and the diameter of the rollers at the contact point. The reverse speed on the pinions is converted to a speed about the central axis by dividing by the gear ratio, and the difference between the two pinion speeds then gives the output speed of the transmission. This output speed of the transmission becomes zero when the ring roller ratio equals the gear ratio. Thereafter, it reverses.

This transmission incorporates a differential feature in its mechanism. Consequently, output speed is always less than motor speed. Transmissions of this type are available which will carry as much as 5 horsepower. From this point, they graduate downward to fractional horsepower units.

A later article will discuss hydraulic type variable speed drives.

Texas Eastman—Longview, Texas

Chemical plant operation added to booming East Texas industrial area. Program initiated by Tennessee Eastman's Laboratories in Kingsport.

IN late January, another new chemical plant started operations in Texas. On the outskirts of Longview, Texas, natural gas and propane started flowing into a maze of pipelines, furnaces, reactors, condensers and columns, which are located on a 2400-acre plant site. This event climaxed a program initiated in Tennessee Eastman Company's research and development laboratories in Kingsport, Tennessee, some six years ago and represents a step toward self-sufficiency as far as the company's raw materials are concerned.

Raw Materials

For many years Tennessee Eastman's principal raw materials have been cellulose and ethyl alcohol (Ethanol). Ethanol is converted to acetic acid, acetic anhydride, butyric acid and butyric anhydride. These acids and anhydrides, together with cellulose, are used in the manufacture of Eastman cellulose esters and other chemicals. The sale of these esters as such plus their use in Eastman acetate textile yarns and fibers, Tenite plastics and in the manufacture of Eastman Kodak's safety film make them the company's principal product.

There were, of course, many factors which influenced the final decision resulting in Texas Eastman. Of these, however, two were uppermost in the minds of management. One had to do with ethanol itself—Tennessee Eastman's dependence upon ethanol; the unstable price of ethanol; and the potential shortage of this basic raw material. The second factor had to do with the long range outlook for butyric acid and for cellulose acetate butyrate and Tenite II which are dependent on butyric acid.

It was concern over butyric acid which set in motion the first development work in Kingsport. This work resulted in successfully combining a synthesis gas consisting of carbon monoxide and hydrogen with propylene under high pressure to form normal and iso butyraldehyde along the general principles of the German Oxo process. Thus was the first hurdle passed, since the conversion of the aldehydes to alcohols and acids is accomplished in processes at which Tennessee Eastman has long been experienced.

The next step was to find a source of propylene. Consultations and experience gained through research,

which had been carried on in Kingsport over the past several years on gas cracking problems, convinced Eastman chemists and engineers that thermal cracking of propane was the answer. Not only could they get their propylene by this process, but they could also get a big dividend—ethylene, and ethylene was a stepping stone to ethyl alcohol. Starting with propane, then, Tennessee Eastman could get acetic acid and acetic anhydride for their cellulose acetate, butyric acid and butyric anhydride for their mixed esters.

Two other raw materials were necessary, carbon monoxide and hydrogen for the modified Oxo process, and hydrogen for the conversion of both of the aldehydes to their respective alcohols. Here again a single reaction could supply both requirements, and equipment to accomplish this had already been developed by others. Carbon dioxide, natural gas and steam react at high temperatures to produce carbon monoxide and hydrogen. This reaction was ideal since abundant natural gas could be found in the same area as propane.

Only one problem remained, the conversion of ethylene to ethyl alcohol. The most widely used process to accomplish this involves the use of sulfuric acid but the shortage of sulfur made this method impractical. So back to the pilot plant went the chemists and in due time they developed a route from ethylene to ethanol which did not require sulfuric acid.

THE BOOMING EAST TEXAS AREA: Besides the new Texas Eastman plant, Longview has several other industries. *The R. G. LeTourneau Company*, nationally known manufacturers of earth moving machinery, already has a large plant there and is increasing the scope of its operations by the construction of a steel plant. The famous "big inch" pipelines begins in Longview. *The Lone Star Steel Company*, now a producer of cast iron pipe, has a large integrated steel plant going up just 30 miles north of Longview. Texas Eastman Company is a division of Eastman Kodak Company. All of the products of the Texas plant will be used or sold by Tennessee Eastman Company, Kingsport, Tennessee, another division of Eastman Kodak. *H. H. Imray* is assistant vice president of the Texas operation.

The Texas Eastman plant is located about five miles from Longview on the banks of the Sabine River. As is the case with most Texas rivers, the Sabine is a small stream during most of the summer months. Because of this, Eastman has created a 300-acre lake on its property by erecting a dam across a small creek. The lake is in the shape of a horseshoe and measures about one and one-half miles around from tip to tip. Into one end of the lake river water is pumped as needed. Also into this end of the lake condenser water is discharged from the plant. Water for plant use is taken from the bottom of the other end of the lake. The lake thus provides a great settling and cooling basin which will be of particular importance in the summer months when the Sabine is low, full of silt and its water at an elevated temperature.

The major portion of the plant itself is located in the center of the horseshoe formed by the lake. The plant is built around the steam plant and the reactor building. At one end are the units where natural gas, carbon dioxide and steam are brought together and cracked at high temperatures to provide synthesis gas for the Oxo process and hydrogen for subsequent hydrogenation reactions. At the other end propane is cracked and propylene and ethylene separated.

The propylene and synthesis gas from these two operations are fed under high pressure into catalytic reactors where a mixture of n-butyraldehyde and isobutyraldehyde is formed. The aldehyde mixture from the reactors is then separated and refined.

The ethylene from the propane cracking units is sent to the alcohol plant where it is converted directly into ethyl alcohol. The alcohol units will be the last to get into production, and probably will not be ready until April, 1952.

The production of n-butyraldehyde will be split three ways, a portion to be sold as the aldehyde, a portion shipped to Kingsport, Tennessee, where it will be converted to alcohol and acid for use in manufacturing cellulose acetate butyrate and Tenite plastic, and a portion converted to 2-ethyl hexyl alcohol for use in manufacturing dioctyl phthalate in Kingsport.

Texas Eastman at Longview, Texas, cracks propane in the furnaces at the right and separates the propylene and ethylene so formed in the columns in the background.

Questions and Answers for Men in the Plant

HOW, WHY, WHEN, and WHERE

This is the third of a series of "Q&A" articles designed to help plant men become more intimately acquainted with the equipment in their charge. A thorough understanding of the points covered, will improve operation and maintenance, and help employees advance to higher positions.

By A. T. LOHKAMP
Plant Engineer
Pasco Packing Co.
Dade City, Florida

PART 3

Water Conditioning--Theory and Equipment

This first section on water treatment defines terms and describes basic equipment. Next month the author will discuss water treatment problems and solutions from the operator's point of view.

Q—What does "P" alkalinity indicate?

A—"P" alkalinity reading indicates that all hydrates and ½ the carbonates have been neutralized by the acid added. The pink color of phenophthalein will disappear as soon as the above is accomplished by the addition of acid.

Q—What does "M" or Methyl Orange Alkalinity indicate?

A—When the yellow color of Methyl orange added to the sample changes to light pink or orange (acid), all the hydrates or all the carbonates (whichever are present) are neutralized by the addition of acid.

Q—Will bicarbonates alone give a pink color when phenolphthalein is added to the sample?

A—No, bicarbonates will not show a pink indication when phenolphthalein is added to the water sample. Bicarbonate water, when all alkalinity is due to bicarbonates, will remain clear when phenolphthalein is added, but will show alkalinity (turn yellow) when Methyl orange indicator is added.

Q—Why do we maintain 2P-M on the positive side?

A—2P-M or two times the "P" alkalinity minus the Methyl orange alkalinity on the positive side indicates that the water being checked has an excess hydrate alkalinity, which is preferable since there will be less CO_2 in the steam generated in the boilers. .

Q—What causes condensate return line corrosion?

A—Return line corrosion is usually caused by CO_2 (carbon dioxide) in the steam. When the steam condenses the carbon dioxide goes in solution and causes the condensate to be corrosive.

Q—Will oxygen cause return line corrosion?

A—Yes, but oxygen can be removed from boiler feed water by deaeration of the feed water. Any residual oxygen can be taken out of the boiler water by feeding sodium sulfite to the feed water and maintaining a residual sulfite in the boiler water. The sulfite reacts with oxygen to form sulfate, thereby, removing the free oxygen from the boiler water.

Q—Can CO_2 be removed from boiler feed water?

A—Yes, CO_2 can be removed by heat. If feed water is heated to 190 degrees F or above in a space where the gas can escape, there will be little or no carbon dioxide remaining in solution.

Q—What is formed when CO_2 goes into solution with water?

A—Carbon dioxide and water form Carbonic acid.

Q—If carbon dioxide is removed upon heating and a lime soda hot-process softener is used, where there is ample space and opportunity for gas removal, where does the CO_2 in the steam come from?

A—Carbon dioxide (CO_2) in the steam is produced by the decomposition of the bicarbonate and carbonate content of the feed water within the boiler.

Q—What are the bicarbonate, carbonate, and hydrate radicals?

A—HCO_3 is the bicarbonate radical
CO_3 is the carbonate radical
OH is the Hydrate radical

Q—What is the reaction that produces CO_2 from bicarbonate; from carbonate?

A—The following reactions take place under conditions existing in the boiler drum: Sodium bicarbonate ($2NaHCO_3$) plus heat reacts to form Sodium Carbonate (Na_2CO_3), water, and carbon dioxide (CO_2). The carbonate formed in the above reaction and the carbonate of the feed water are then decomposed as follows: Na_2CO_3 plus water (H_2O) plus heat reacts to form sodium hydroxide ($2NaOH$) and carbon dioxide. The numbers placed before the formulas only indicate the number of parts to make the equations balance.

Q—Will sodium hydroxide produce CO_2 in steam?

A—No, it will not produce CO_2.

Q—What does 2P-M indicate?

A—2P — M indicates total hydrates. If on the + side then the alkalinity is hydrate alkalinity. If in performing the above mathematical operation, the answer is negative or "M" is greater than two times "P," then M—2P equals the bicarbonate and 2P equals the carbonate. When this occurs the water will decompose in the boiler and form CO_2 in the steam. The amount of carbon dioxide in the steam will be equal to (M — 2P) × .79 plus 2P × .35 in parts per million. Example: P equals 18; M equals 40; 2P — M equals (2 × 18) — 40 equals —4. Then CO_2 in steam will equal 4 × .79 plus 36 × .35, or 3.16 plus 12.6, or 15.76 parts per million.

Q—If P equals O and water has methyl orange alkalinity, what is indicated? How much CO_2 will there be in the steam?

A—If P equals O and the water is alkaline to methyl orange then the water contains bicarbonate alkalinity and the bicarbonates are equal to M. The amount of CO_2 in the steam will be equal to the M alkalinity of the feed water times .79. Pasco water before treatment has the following P & M values: P equals O, M equals 136. This water, if fed to the boilers without treatment would produce: 136 × .79 or 107.44 parts per million of CO_2 in the steam and the condensate returned would be very corrosive. However, don't forget that any condensate returned would dilute this feed water. If 50% condensate were returned and heated in a vented space, then the CO_2 in the steam would only be about half the above amount.

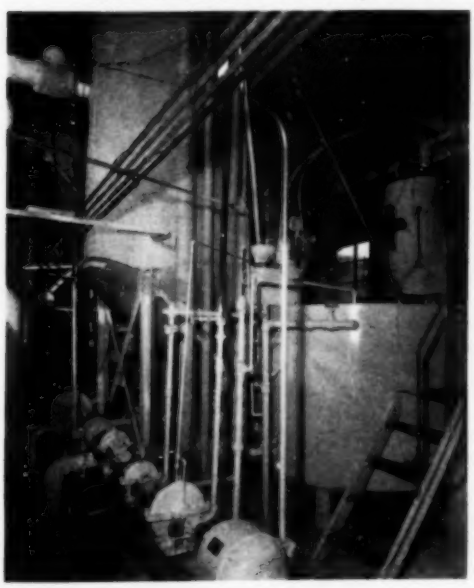
Q—Suppose that 2P is greater than M, what would be indicated? How much CO_2 would be in the steam?

A—If 2P is greater than M, then 2P — M would be + or positive, and hydrate alkalinity would be indicated. The amount of CO_2 in the steam would be equal to 2(M — P) × .35 parts per million. As an example: let's take a P of 22 and M of 40. Then 2P — M equals +4, so water contains hydrate alkalinity.

CO_2 equals 2(M — P) × .35 equals 2 × 18 × .35 equals 12.6 ppm or 3.16 ppm less than if 2P — M were —4 as previously explained.

Q—By treating with lime-soda hot-process, can you ever expect to

Water treating equipment at Pasco Packing Co. The view at left shows chemical tanks, chemical pumps, filter backwash pumps, softener booster water pump, and bottoms of filters. The view at right shows top of second stage and middle section of first stage water softeners.



eliminate CO_2 from the steam?

A—No, not and keep a balance between the other variables of water conditioning.

Q—Can you treat with Zeolite and get rid of CO_2?

A—No, not usually. It can be reduced by reducing the "M" alkalinity through using sodium-hydrogen zeolite or acid treating before and after zeolite to reduce the M alkalinity. Some plants destroy all alkalinity with acid, then pass the water through a stainless steel deaerating heater and neutralize the effluent with caustic soda, but there will still be about 2 ppm of CO_2 in the steam.

Q—What can be done to prevent return line corrosion caused by CO_2 since it is so difficult to prevent CO_2 in the steam?

A—Various chemicals can be used to neutralize CO_2 in the steam such as cyclohexylamine and morphaline. A salt such as ammonium sulfate can be fed to the boiler internally. This will neutralize the CO_2, but ammonia and ammonium compounds are extremely corrosive to copper or copper compounds, therefore, not practical for use, because of the brass seats in unions or valves. The cost of Morpholine and Cyclohexylamine make use of these compounds almost prohibitive in many cases. Another thing that can be done is to use a filming amine such as octadecylamine in which the insoluble amine is processed and emulsified so that it can be dispersed and fed from a water solution. This amine does not neutralize the CO_2 but coats the inside of the pipe with a mono-molecular film which protects the pipe by making the inside surface non-wettable. The coating will shed water like a good coating of plastic or rubber. Octadecylamine is contained in Permacol. Fed in the ratio of about 15 ppm it is very effective in preventing return line corrosion.

Q—What is meant by pH of the water?

A—According to the theory of electrolytic dissociation, when water is ionized it contains hydrogen (H) ions and hydroxyl (OH) ions. When the number of H (hydrogen) ions is exactly equal to the number of OH (hydroxyl ions the water is neutral, that is it is neither acid nor alkaline. If the number of H ions is greater than the number of OH ions, the water is acid. If there is a larger number of OH ions than H ions, the water is alkaline. Water or any solution with a pH of less than 7 is acid, with a pH of more than 7 it is alkaline. A pH of 7 is exactly neutral.

Q—At what pH will phenolphthalein fail to turn a solution pink?

A—The end point of phenolphthalein is a pH of 8.3 which is on the alkaline side.

Q—What is the end point of Methyl Orange indicator?

A—The endpoint of Methyl orange indicator is a pH of 4.3 which is on the acid side since it is less than 7.

Q—Why is pH important in water conditioning for boiler feed purposes?

A—The pH of water is important for boiler feed purposes because the pH must be maintained at 9.5 to 9.7 for phosphate softening. Softening reactions will not proceed to completion except at the above pH's. For lime-soda softening the pH is automatically established. For Zeolite softening employing silicious exchange materials the pH of the water flowing to the softener should be in the range of 7 to 8.3 pH and from 4.3 to 8.3 where carbonaceous Zeolite is employed. The pH of boiler water must be maintained above a minimum of 10.5 to prevent acidic corrosion and to provide a sufficiently high pH for the precipitation of the scale forming salts.

Q—What is the pH of good condensed steam?

A—Good condensate will have a pH of 6.5 to 6.9, or slightly acid.

Q—Why won't phenolphthalein turn pink when added to a sample of condensate?

A—Phenolphthalein will not turn pink because the pH of the condensate is too low. The end point of phenolphthalein is 8.3.

Q—Why does Methyl orange turn yellow when added to a sample of condensate?

A—Methyl orange will turn yellow because the pH of condensate (6.5-6.9) is still well within the pH range of this indicator since the end-point of Methyl orange is not reached until the pH drops to 4.3.

Q—What is meant by the term "Suspended Solids"?

A—Suspended solids are those solids which are not in true solution and can be removed by filtering.

Q—What is meant by dissolved solids?

A—Dissolved solids are in true solution and cannot be removed by filtering.

Q—What is meant by total solids?

A—Total solids is a term applied to the sum of the suspended solids and the dissolved solids.

Q—What softening processes may be used for complete removal of dissolved solids?

A—Dissolved solids can be completely removed by cation-anion exchange units, or by using evaporators.

Q—Why are total solids of importance in boiler water?

A—The total solids, or sum of dissolved and suspended solids is an important factor in boiler carryover and steam purity. Total solids and alkalinity are the chief causes of carryover. The American Boiler Manufacturers Association in their standard guarantee state the maximum Total solids to be tolerated in any boiler according to pressure, as follows:

Operating Pressure	Total Solids (in ppm)
0-300 psig	3500 ppm
301-450 "	3000 "
451-600 "	2500 "
601-750 "	2000 "
751-900 "	1500 "
901-1000 "	1250 "
1001-1500 "	1000 "

(*Continued on page* 104)

R. G. LeTourneau, Inc., Longview, Texas, describes

a plant tested

Statistical Quality Control Method

for the small manufacturer

By C. MELVIN BROOKING

Chief Industrial Engineer, R. G. LeTourneau, Inc., Longview, Texas

Many control systems collect data from 100-150 parts and then compute control limits for the process. LeTourneau's system is based on specifications—ideal for the small manufacturer.

MANY manufacturers have not availed themselves of the benefits of statistical quality control in the belief that it was a technique used only in mass production plants. Such is not the case.

The small manufacturer can utilize this system of controlling quality and gain many of the same benefits that large manufacturers are today enjoying—improving manufacturing and inspection efficiency, predicting impending trouble in a process, instilling quality consciousness in the plant, and building good will among the customers.

Statistical quality control is used in just this manner in the manufacture of heavy earth moving equipment at the Texas Division of R. G. LeTourneau, Inc., in Longview, Texas. We do not consider ourselves mass producers in the same sense as the automotive plants, appliance manufacturers, and radio manufacturers. We produce heavy machinery in quantities that often give us lot sizes as small as 100 pieces for some of the component parts. We apply statistical quality control to these lots as well as the large lots. Here is how it is done in respect to operations in our machine shop.

A statistical quality control chart is prepared for each machining operation that is to be inspected. This chart is prepared before the parts have been put in process. The chart is filled out completely, including control limits which have been computed on the basis of the manufacturing specifications. These charts are kept on file in the inspection gage crib. At the time the manufacturing job is set up, the chart is checked out and hung in a conspicuous place on or near the machine.

The Machine Operator

The operators are instructed to aim at the mean dimensions as specified on the blue print and to make every effort to hold the dimensions within the control limits on the chart. As the parts are produced they are laid aside on the skid or table, in the order in which they were produced, awaiting inspection. If the operator produces a piece which he knows does not meet specifications, he lays it aside and notifies the quality control inspector. If the results of the quality control inspection, when plotted on the chart, fall outside of the control limits, the operator is questioned as to what caused the point to go out of control and what is being done to correct the situation.

Parts Movement

The quality control inspector, at the start of each new job, places a hold ticket on the material being processed to indicate that the job is under the surveillance of the quality control inspector and is not to be moved without his permission. When the job is completed the inspector signs the hold ticket and the material is moved to the next operation.

Upon arrival of the parts at the next operation the inspector, before starting inspection, will verify that the parts have been properly released from the previous operation before he starts inspecting the next operation. If parts have been properly released, the old tag is removed and a new one is placed on the parts for the second operation.

Inspection of Parts and Plotting Points

At the time the original chart is prepared, the chief inspector determines the amount of inspection to be performed. This is recorded on the chart. As a rule, a new job calls for inspection of 5

out of 10 pieces in a lot size.

The quality control inspectors are roving inspectors moving from one job to another performing their inspection operations while the parts are being produced. The first five pieces produced on an operation are represented by the first point on the chart. In the case of 50 per cent inspection the quality control inspector continues to inspect 5 out of every 10 pieces in the order in which they were produced. This is a random sample. The quality control inspector may take the first 5 pieces, the last 5 or any other 5 pieces out of the 10. As these pieces are inspected and found satisfactory, they are marked or stamped to show they have been approved.

Explanation of Symbols

Symbols employed in this discussion are standard symbols used in statistical quality control work.

X is the symbol for one measurement.

$\bar{X}$ is the symbol for the average measurement in a sample of several pieces (average of the X's).

$\bar{\bar{X}}$ is the symbol for the centerline of the chart and represents the average measurement taken from averages of a group of samples. (Average of the $\bar{X}$'s.)

R is the symbol for the range or the difference between the smallest and the largest dimension in a sample.

$\bar{R}$ is the symbol for the average range in a group of samples and is used as the centerline of the range chart.

Computation of Control Limits

Control charts used for machining operations are the $\bar{\bar{X}}$ (average) and the R (range) chart. They are based on engineering specifications. LeTourneau is able to compute control limits and established control chart procedure from the first piece on.

Many quality control systems collect data from 100 to 150 parts and then compute control limits for the process. These limits are then analyzed to see if they have the proper relationship to the specifications. If the control limits are satisfactory, they are used to control future production. However, to the small manufacturer with limited production this system would be of little value.

Control limits for the average chart are computed as follows: The mean dimension is used as the center line ($\bar{\bar{X}}$) of the average chart.

$$\text{Upper Control Limit (UCL)} = \bar{\bar{X}} + \frac{\text{Tolerance} + C}{\sqrt{n}}$$

$$\text{Lower Control Limit (LCL)} = \bar{\bar{X}} - \frac{\text{Tolerance} + C}{\sqrt{n}}$$

C is a constant used in the formula

For tolerances of .001 and greater: C = .0009

For tolerances of less than .001: C = .00009

n is the sample size

LeTourneau, Inc. at Longview, Texas has standardized on a sample size of 5 pieces.

Control limits for the range chart are computed as follows: $\bar{R}$ (average range) is the center line of the range chart.

$$\bar{R} = \frac{2 \times \text{Tolerance} \times d_2}{6}$$

$$\text{Upper Range Limit (URL)} = D_4\bar{R}$$

$$\text{Lower Range Limit (LRL)} = D_3\bar{R}$$

d_2, D_3, and D_4 are constants in the formulae, their values varying with sample size. For a sample size of 5, the values are 2.326, 0, and 2.114 respectively.

For additional values for other lot sizes see *A.S.T.M. Manual on Presentation of Data*, page 50, published by American Society of Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Application of Formula

Note the charts on the following page. Our example is a shaft with a turn size of 2.000 ± .004. Sample size is 5.

Control limits for the average chart:

$$\text{Control Limits} = \frac{\bar{\bar{X}} \pm \text{Tolerance} + C}{\sqrt{n}}$$

$$= 2.000 \pm \frac{.004 + .0009}{\sqrt{5}}$$

$$= 2.000 \pm \frac{.0049}{2.236}$$

$$= 2.000 \pm .0022$$

$$UCL = 2.0022$$

$$LCL = 1.9978$$

Center line $\bar{\bar{X}}$ for the average chart is the mean dimension, 2.000.

Control limits for the range chart:

$$URL = D_4\bar{R}$$

$$= 2.114 \times .0031 \text{ or } .006$$

$$LRL = D_3\bar{R} \text{ or } 0^*.$$

$$\text{Center line} = \bar{R} = \frac{2 \times \text{tolerance} \times d_2}{6}$$

$$= \frac{2 \times .004 \times 2.326}{6}$$

$$= \frac{.0186}{6} \text{ or } .0031$$

*For a sample size of 6 or less the lower range limit is always 0.

Quality control chart (right) is prepared for each machining operation that is to be inspected. Chart is made before parts have been put in process. Note control point checks (right and below) on the HD 6005 shaft being fabricated.

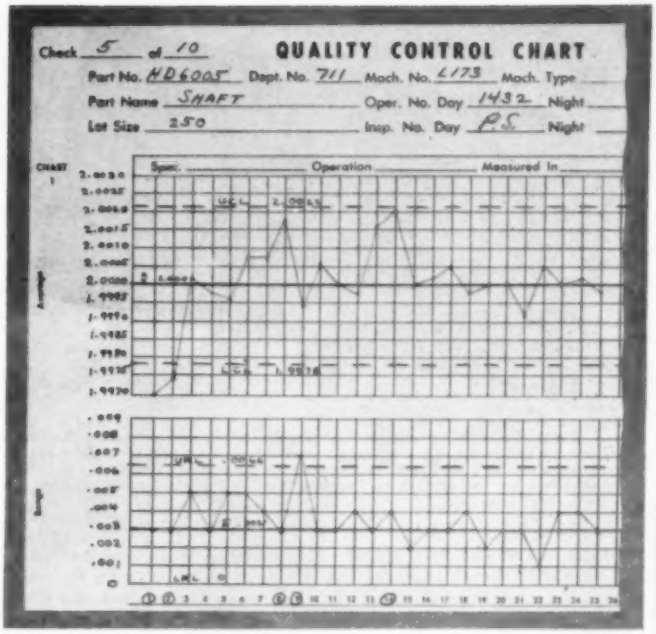
At 8:15 am (#1) the process level was too low and operator cautioned.

At 9:10 am (#2) process level was still too low and foreman notified.

At 2:50 pm (#8) the upward trend was investigated. Operator found that tool needed changing.

At 3:35 pm (#9) the range was checked and tool was found to be improperly set.

Another check at 10:55 am (#14) the next day revealed that the process level was again high and the operator was cautioned.


Check 5 of 10
QUALITY CONTROL CHART
Part No. HD6005 Dept. No. 711 Mach. No. L173 Mach. Type
Part Name SHAFT Oper. No. Day 1432 Night
Lot Size 250 Insp. No. Day PS Night
Spec. Operation Measured In
CHART 1
Average
Range

The inspection data are recorded on a data sheet. The necessary computations are made and the points plotted on the chart.

Out of Control Points

Investigation of out of control

Quality Control Data sheet on HD 6005 shaft. Upper Control Limit 2.0022; Lower Control Limit 1.9978; Upper Range Limit .0066; and Lower Range Limit 0.

QUALITY CONTROL DATA

Part No. HD 6005 Operators No. 1432 Unit of
Part Name SHAFT Machine No. L173 Operatio
Job No. 7204-J Dept. No. 711 Spec. Li

Date	Time	X1	X2	X3	X4	X5	Total	Ave. X	Ran. R	#
9-25	8:15	1.997	1.996	1.996	1.999	1.997	9.9850	1.997	.003	(1)
	9:10	1.998	1.999	1.997	1.997	1.996	9.9870	1.9974	.003	(2)
	10:00	2.001	1.999	1.998	2.003	2.000	10.0010	2.0002	.005	3
	10:50	2.000	1.999	2.002	2.000	2.001	9.9990	1.9998	.003	4
	11:30	1.997	1.999	2.001	2.001	1.999	9.9980	1.9996	.005	5
	1:15	2.003	2.001	2.000	1.998	2.001	10.0040	2.0008	.005	6
	2:00	2.002	2.003	2.000	1.999	2.000	10.0040	2.0008	.004	7
	2:50	2.001	2.003	1.996	2.002	2.002	10.0090	2.0018	.003	(8)
	3:35	2.003	1.999	1.999	2.000	1.999	9.9970	1.9994	.007	(9)
	4:20	2.002	2.001	1.998	2.000	2.001	10.0030	2.0006	.003	10
9-26	8:30	2.000	2.001	2.000	2.000	2.001	10.0000	2.0000	.003	11
	9:15	1.999	2.000	2.000	1.998	2.002	9.9990	1.9998	.004	12
	10:00	2.002	2.003	2.001	2.001	2.002	10.0080	2.0016	.003	13
	10:55	2.000	2.000	1.999	1.998	2.002	10.0010	2.0002	.004	(14)
	11:45	2.001	2.000	2.001	2.000	2.000	10.0000	2.000	.002	15

At the start of each new job the quality control inspector places a hold ticket on material being processed to indicate that the job is under surveillance and is not to be moved without his permission. When the job is completed, the inspector signs the hold ticket and the material is moved to the next operation.

points is one of the most important phases of the quality control inspector's job. Even though the points do not fall outside of the control limits, if several points indicate a trend that looks suspicious this is also investigated. Whenever an investigation is made it is indicated on the chart. The point is identified and a note made on the back of the chart giving: date and time point was plotted, cause of the condition, what was done to remedy the situation, whether or not the correction was successful.

After plotting a point that is out of control, the quality control inspector checks all parts back to the last sample that was in control and checks all parts 100 per cent until the process is again brought into control.

The quality control inspector notifies the shop foreman when a point falls out of control. If the out of control condition presists, the job, upon the mutual agreement of the shop foreman and the chief inspector, is stopped. When the chart indicates that the process is under satisfactory control, the chief inspector reduces the frequency of inspection.

Parts that are rejected are given a reject tag giving complete information as to what is wrong and who or what was responsible. This tag is used further to report scrap to the accounting department and to the production control department, also to analyze causes of scrap and to charge the cost of scrap against the department responsible.

Measuring the Effectiveness of LeTourneau's Quality Control System

Our statistical quality control program has been effective in the following ways:

1. Our control charts are placed on or near the machine in full view of the operator, the inspector, and the foreman, where they may **constantly see the quality of work being produced.**

2. Since control limits are based on formulae using the specifications, we are able to place the control chart, complete with control limits established, **on a new operation right from the beginning.** This has an advantage over quality control procedures which call for the running of from 100 to 150 pieces before control limits can be established. This time lapse can result in a serious delay and could not be used in a plant producing small lot sizes.

3. Supervision is quick to take corrective action on processes headed for trouble since they operate under a budget which contains scrap and reoperation as two of the items which are controllable by them. They recognize the value of quality control in **predicting trouble in a process,** thereby enabling them to take corrective action before scrapping or reoperation becomes necessary.

4. **Quality control has reduced inspection costs.** With very few exceptions we inspect only 50 per cent or less. The control chart is a tool that tells us in each case how much inspection is necessary to insure a quality product.

5. Relations between production, inspection and engineering are such that **complete cooperation** is enjoyed in solving a quality problem. This is the result of training programs that were conducted for supervision and inspection. We are also fortunate in having in our employ students and graduates of LeTourneau Technical Institute, where statistical quality control is taught as one of the subjects in their engineering curriculum, thus giving these workers a detailed knowledge of these techniques.

6. We have impressed upon supervision and the operators that the installation of our statistical quality control program does not shift the responsibility for producing quality work upon the shoulders of our quality control department. It is still the **supervisor's and operator's responsibility to produce a quality product.** Repeated inspection of a part does not improve its quality; it must be made properly by the operator from the beginning.

7. Quality control has **reduced costs.** It has reduced materially the amount of scrap and reoperation. Time formerly spent on reoperation and on material that was eventually scrapped has been made available for productive work.

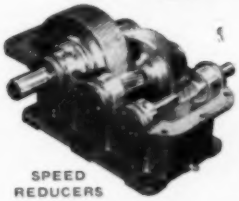
Continental ELEVATORS

TYPICAL GRAIN ELEVATOR

BUCKETS (ALL TYPES)

TAKE-UPS

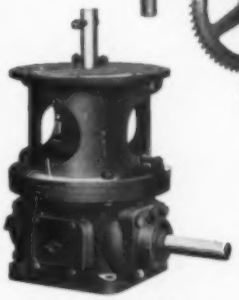
PILLOW BLOCKS



SPEED REDUCERS

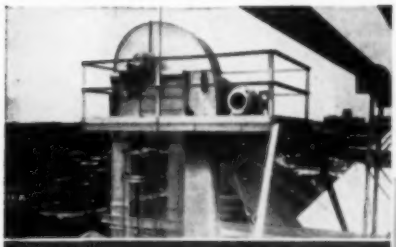
TOP DRIVE

SPROCKETS AND CHAIN



BOTTOM DRIVE

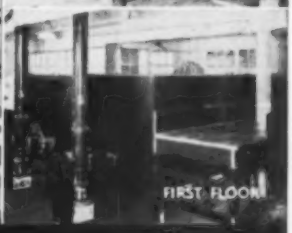
SCREW ELEVATOR WITH FEEDER SECTION



Continental offers a complete line of Standard Bucket and Screw Elevators. Special units designed to suit unusual conditions. Standard accessories and Power Transmission Equipment carried in stock.

Let Continental furnish your next installation.

CG-5004



Industrial Division **CONTINENTAL GIN COMPANY** Birmingham, Alabama

Skid-proof metal work platforms cut

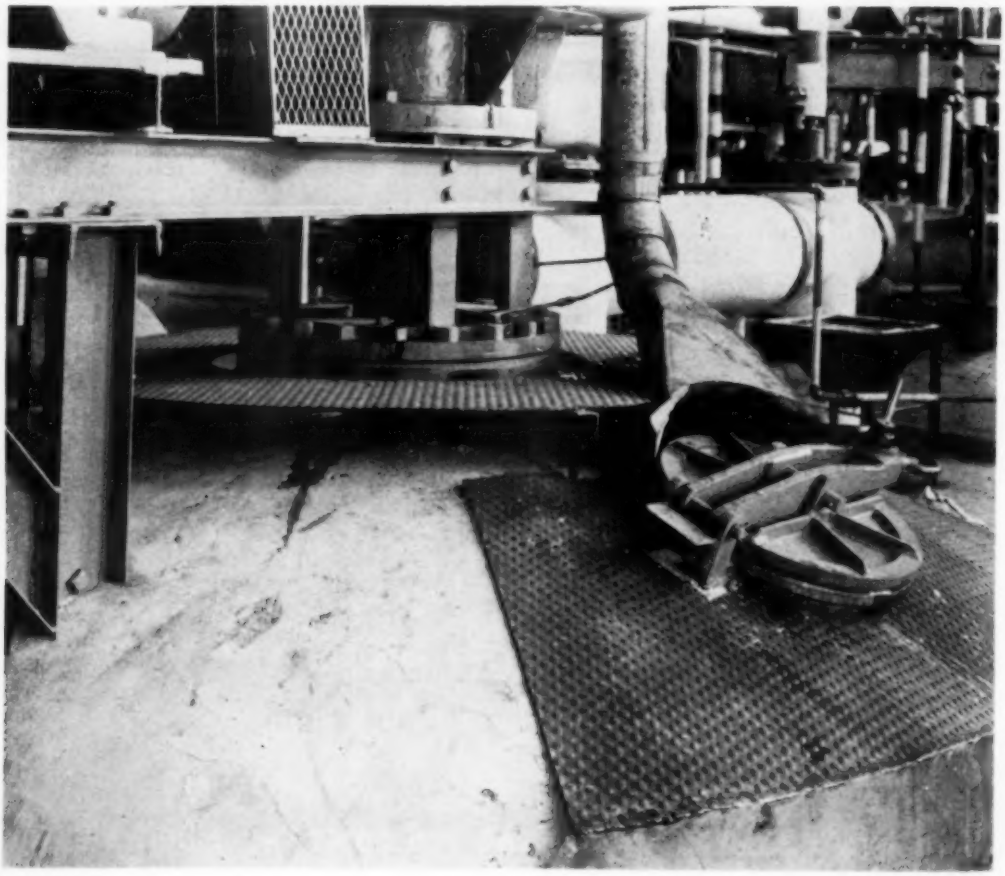
Insulation Maintenance Costs

THERMAL insulation is primarily designed and applied to cut heat loss; it's no secret that it isn't much of a walking surface. To maintain insulating efficiency and appearance, it is wise to isolate insulation surfaces from accidental damage by plant personnel.

The photo shows how skid-proof metal plates protect insulation around the center and hatch of a reaction kettle at a chemical plant. Employees formerly braced their feet against the insulation itself to remove the hatch cover. Additional expense of the metal plates is small compared to savings obtained through reduced maintenance.

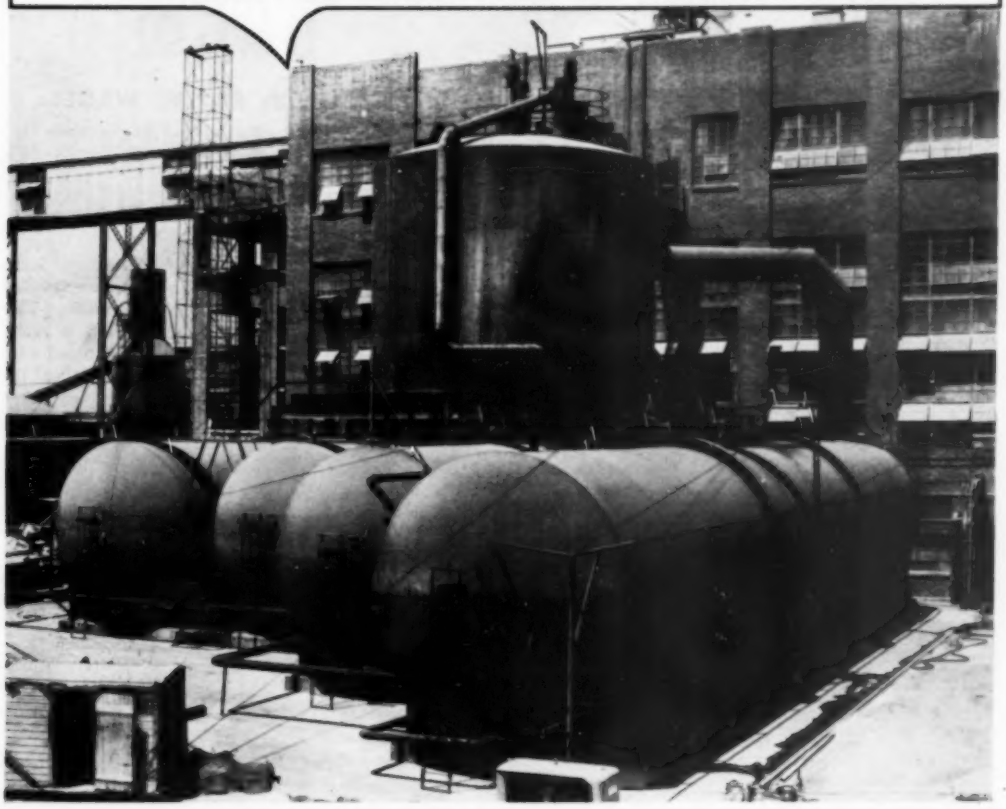
The kettle, at 550 F, is covered with 3-in.-thick mineral wool blankets finished with insulating cement.

Courtesy Industrial Mineral Wool Institute



Brown Stock Washing System

UTILIZES HORTON WELDED STEEL TANKS



THE Macon Kraft Company at Macon, Georgia, is one of the South's important producers of kraft board. Last year its daily output was over 600 tons with a single day's production record of nearly 650 tons.

Several specially fabricated Horton tanks and processing structures play an important part in the integrated operation of Macon Kraft Company's pulp mill, chemical recovery plant and wood yard. Among these units are six 4300 cu. ft. Horton digesters, two 600-ton storage tanks, a blow tank, an accumulator, a burned lime tank, an elevated water tank, and the four seal tanks and foam tank pictured above.

The seal tanks are used in the brown stock washing system. Filtrate from four-stage washers discharges into them through barometric legs that create vacuum for the washers. Surmounting the seal tanks is a foam tank equipped with twin centrifugal foam breakers.

In the pulp and paper industry—and also in other industries—Horton tanks and processing structures are providing efficient, dependable service. Each unit is carefully built to exacting specifications to meet individual requirements.

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ELECTRICITY and ELECTRIC POWER

Part 3—Controls for Alternating Current Motors

A-C motors—types, characteristics, and applications were featured in February. This article discusses the means of starting, controlling, and stopping motors.

By ROY W. WAGES
Division Industrial Power Engineer
Georgia Power Company, Columbus, Georgia

CONTROL is the word used to describe those devices employed to conveniently and effectively start a motor and bring it up to its normal running speed in a manner that protects both the motor and the electrical system to which it is connected from abnormal or undesirable conditions. There is nothing mysterious about it despite the elaborate covers, mechanisms, and high-sounding names sometimes applied.

Small Motors

For small, single-phase motors, the control equipment is no more elaborate nor complicated than the switch that is used to turn on the lights at home. If all control devices will be thought of as basically just that, it will assist materially to a better understanding of this equipment.

Fundamentally, a starter has two reasons for being—to start the motor and to stop it. For small, single-phase motors that is all the motor control does. This is accomplished by connecting the motor to a power line for starting and disconnecting it from the line for stopping. Devices so employed to start and stop motors are called *across-the-line* starters and are built to be operated manually or magnetically.

In the practical application of this kind of starter, there are several advantages and disadvantages. Among the *advantages* are: simplicity, economy and higher starting torque.

Among the *disadvantages* are: large starting current, objectionable voltage drop and sudden application of full voltage torque.

Perhaps the most common method now employed in starting large squirrel cage motors is the so-called *compensator* or *autostarter*. This name is applied to what is really an autotransformer combined with some method of connecting the motor to it for starting and then switching the motor directly to the line for running.

A transformer is, as defined in the American Standard Definitions of Electrical Terms, "an electrical device, without continuously moving parts, which by electromagnetic induction transforms electric energy from one or more circuits to one or more other circuits at the same frequency, usually with changed values of voltage and current." An autotransformer is nothing more than an ordinary transformer whose primary and secondary circuits have part of a winding in common.

An autotransformer has several advantages over an ordinary transformer. It is smaller, uses less exciting current, and costs less. Since the whole idea behind the use of a transformer in starting a motor is to provide reduced voltage and reduced starting current, the autotransformer was selected.

How a compensator or autotransformer works is illustrated. By such an arrangement various fractions of full line voltage can be applied to the motor in starting. Once the motor has reached full speed, it can be switched from the autotransformer to the main line by means of a lever and a double-throw switch.

By applying a reduced voltage in starting, the currents drawn from the line during this operation

What Takes Place in *Across-The-Line* Starting?

A squirrel cage motor is very similar to a transformer—the stator comparable to the primary and the rotor comparable to the secondary. When the motor is at rest, it acts very much like a short-circuited transformer at the moment voltage is applied. Because of this, it draws a large amount of current from the line. Where large motors are involved, this current value may be of a magnitude greater than can be safely supplied by the circuit.

When this large starting current is suddenly drawn from the line, two things happen:

(A) A relatively large voltage drop occurs which (1) causes light flicker and (2) creates a voltage dip that may adversely affect other apparatus connected to the power line.

(B) Full voltage torque is suddenly applied which may damage the mechanical drive.

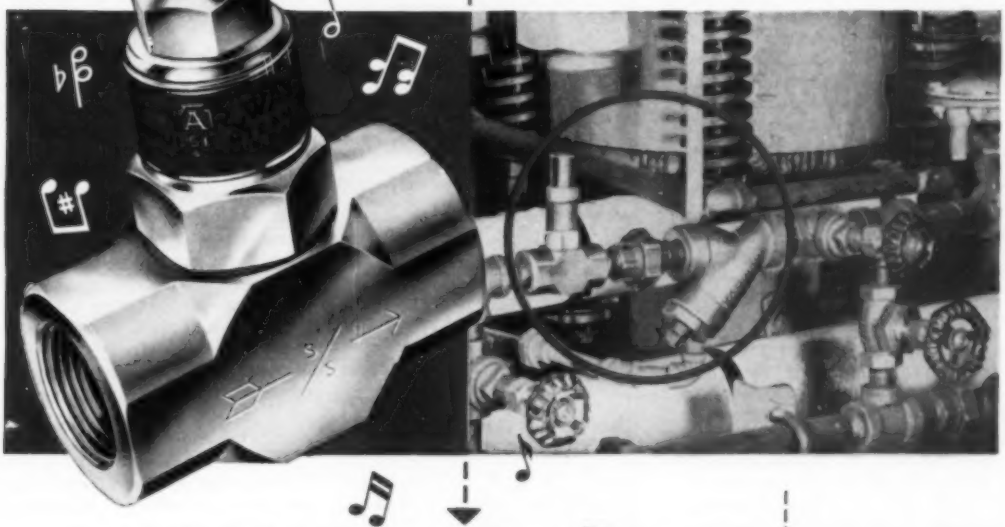
Thus, except for motors 10 hp and under, a careful study should be made of the power supply and point of application before across-the-line starting equipment is purchased.

hot presses make sweet music

If a 30% increase in production sounds like sweet music to you—keep your ear tuned to this story.

One of the largest manufacturers of phonograph records recently relocated 60 of their record presses, and also equipped each one with a ½" Yarway Impulse Steam Trap and Strainer. What happened? A 30% increase in record production . . . plus a decision to equip all 130 presses in the plant with Yarways.

It's another example of how these Yarway Impulse Traps can help increase production by sending the most premium B.T.U.'s at top temperatures into your product or process. In plant after plant, *they get equipment hotter, sooner and keep it hot.*



Other Yarway features—small size, easy hook-up, one moving part, low upkeep, stainless steel construction and low cost. Nearly 750,000 Yarway Impulse Steam Traps have already been installed.

It's always convenient to buy Yarway Traps and Strainers. One of the 216 industrial distributors who stock and sell them is located near you.

For his name, and a free copy of the new, helpful 24-page Yarway Steam Trap Catalog write—

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are limited. Characteristics of the squirrel cage motor are such that the stator and rotor currents are very nearly directly proportional to the impressed voltage—the voltage applied to the motor terminals—but when an autotransformer is used, the current in the stator is proportional to the turn ratio of the autotransformer, and the value of the starting current on the line side is proportional to the square of the autotransformer turn ratio. When one-half of the full line voltage is applied on starting, the motor takes or pulls only one-half the current it would draw if thrown directly across the line, and the actual current value on the line side is only one-fourth the value of the full voltage current values. This reduction of the voltage applied to the motor terminals during the starting period prevents huge inrush starting currents.

The advantages of such a compensator starter are relative low cost, ruggedness, and simplicity. The chief disadvantage is that, in spite of its ability to reduce starting currents, it still creates two distinct *jars* or *bumps* on the system, one when thrown into the starting position and another when thrown from *start* to *run* when the motor is actually disconnected from the transformer and connected directly across the line.

Resistance Starters

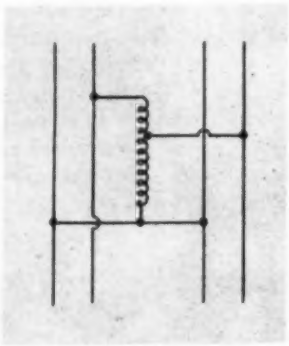
Starting compensators are very popular and are widely used, but resistance type starters have many advantages on large, 220 volt, squirrel cage motors. With resistance starters, the acceleration of the motor and the adjustment of current values for any particular moment in the starting procedure are obtained through a smooth, stepless operation. There is no *bump* to the system because, unlike the compensator, the resistance remains in the circuit throughout the starting sequence, being cut out when the motor is finally brought up to its running speed, and the torque of the motor is smoothly increased.

The resistance type starter is composed of a set of resistors and protective devices. The resistors are placed between the motor terminals and the line and are cut out in sequence. Both compensators and resistor-type starters can be obtained for automatic starting.

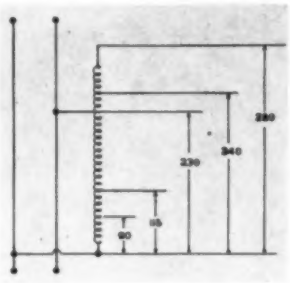
There is another method of starting squirrel cage motors which is called the *wye-delta* method, but it is not commonly used in commercial practice.

Wound-Rotor Motors

A wound rotor induction motor is a motor much like the standard



HOW AN AUTOTRANSFORMER WORKS—A single winding is placed around a core and a tap is pulled out as shown above. Voltage can be changed in same manner as an ordinary transformer. If several taps are brought out (below), several different voltages can be had on the secondary side.



squirrel cage motor except that its rotor is connected to an external resistance by means of rings and brushes. It is sometimes called a *slip-ring* motor. Thus, unlike a standard squirrel cage motor, resistance can be introduced into the rotor or secondary windings of a slip ring motor from an external source.

Control for wound-rotor motors may be had in several forms, but the usual type is the drum switch. This is the familiar *streetcar* control. A drum switch consists of a handle and shaft, upon which is mounted a number of contactors. These, in turn, move upon stationary contacts as the handle is rotated. The entire resistance is in series with the secondary windings of the motor at the starting position, and as the handle is rotated, the resistance is gradually cut out.

Drum type controls are not always used for operating wound-rotor motors. Other kinds of general purpose starters can be used. These controls usually consist of a cabinet which houses the essential parts: accelerating relays, contactors, starting resistor, overload and undervoltage protective devices.

The operation of these controls is automatic from the moment the starting button is pressed until the resistance in the rotor circuit is entirely shunted out by the contactors.

Synchronous Motors

Synchronous motors derive their name from the fact that the rotor or armature rotates with the rotating field no matter what the load. The field is separately excited with direct current. This use, in synchronous motors, of two different kinds of current—alternating and direct—makes the control of synchronous motors considerably more elaborate than other alternating current motors. Synchronous motors have a squirrel cage winding just like an ordinary induction motor, and the starting characteristics of this winding are very nearly the same.

If the synchronous motor has a squirrel cage winding, there is no reason why it cannot be started as a squirrel cage motor using the same type of appropriate starting device — across-the-line, autotransformer, or resistor type, depending on the size and location.

As the motor comes up to rated speed, a speed that is about 95 or 96 per cent synchronous speed, the direct current can be applied to the field, thus causing the field poles to *lock in* and force the rotor to pull into synchronism.

Protective Devices

Control devices are necessary for controlling a-c motors, but without

how many BTU'S in 80 of these?

THERE are other ways to burn up thousand-dollar bills, and maybe you are doing just that in your boiler room.

This is what we mean. Assume that a boiler may be expected to give 200,000 hours of service. A 100,000 lb/hr boiler will burn at least $8,000,000 worth of fuel in that time.

Now—if your combustion control system permits as little as one per cent of that fuel to be wasted, your control system could cost you $80,000 more than you paid for it—five, six, or seven times as much as the initial cost of the system itself!

From this point of view, you cannot afford to buy anything less than the best.

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protective devices, motor controls are incomplete.

Protective devices are of two major types, undervoltage and overload. Undervoltage is not the same as reduced voltage. Reduced voltage starting devices are employed to provide a voltage less than the normal line voltage across the motor terminals. This reduced voltage provides a reduced starting current, but one that will clearly accomplish the work.

Undervoltage protection means that should the voltage fail or power be interrupted for any reason and then come back unaided, the undervoltage protective device will prevent the motor starting up again until the operator goes over and clears the line and restarts the motor by personally accomplishing the starting operation. Plant men can readily see where an operator might be badly crippled or even killed by a motor suddenly starting up again after a power failure or loss of voltage.

In commercial application, undervoltage protection is accomplished by means of a contactor and a button. When the button is pushed in on starting the motor, this contactor closes the circuit as the coil of the contactor is energized. In the event a loss of voltage or power failure occurs, this coil is de-energized, thus allowing the contactor to drop out or open up. The motor cannot be started up again until the contactor is manually reclosed and motor started in the usual way.

In some applications, undervoltage protection is provided by means of spring-return switches. However, the principle is the same as that for the push button.

An overload protective device is a device that protects the motor from excessive currents. A fuse is one kind of an overload protective device—indeed, it was the first such device. But the fuse was not versatile enough. If the fuses were large enough to withstand the starting currents of a motor, they did not protect the motor against lesser overloads which, none the less, were harmful to the motor windings. Sawmill operators readily understand this problem through experience with peak loads of short duration.

The overload protective device most in use today is the overload relay, a device designed to disconnect the motor from the line at the instant the current reaches a predetermined value. There are overload relays that work instantaneously and others that have a delaying element. These are generally classified as instantaneous, definite time, and inverse time relays.

Mechanically, overload relays are broken down into two major classifications, magnetic overload relays, and thermal overload relays. Thermal overload relays are the most widely used.

A magnetic overload relay is simple. It consists of a coil and a set of contacts. Generally, the device is built so that under normal conditions the contacts remain closed. Under abnormal conditions the overload contacts, operating from their coil, force the line contacts to open or drop down, thus breaking the circuit and removing the motor from the line.

There are several kinds of thermal relays. Some employ a bimetal unit, some a film of solder, and some a direct expansion unit. However, all thermal overload relays are provided with an element that heats just as the motor windings and by the same current.

A heating coil is connected in series with the motor windings and is wrapped around a bi-metallic strip. This strip is so arranged that one end of it acts as a trigger which holds in place a contact under tension from a spring. An excessive flow of current will heat the coil, and it in turn heats up the bi-metal strip, thus causing the strip to move off the contact. The spring then opens the contactor, breaking the circuit, and cutting the motor from the line. A reset button is provided for resetting the mechanism.

Extreme care should be used in selecting thermal overload relays. Unless the man in the plant is dead sure, he should call in the manufacturer's representative for assistance.

Part 4 of this Electricity and Electric Power series—Power and Lighting Transformers, will be published in the April issue.

Latest "Dog House" Design

While most boilers are installed in boiler rooms and completely protected from the elements, such housing is not essential to their operation. *Superior Combustion Industries, Inc.*, reports that many of their generators have done temporary outdoor duty while boiler rooms were under construction or renovation. Others have been built especially for outdoor installation. To cover the vital working parts, the illustrated special housing has been designed. Unit makes all working parts readily accessible and provides the required protection.

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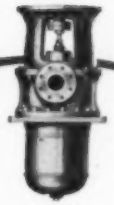

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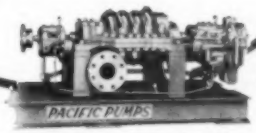

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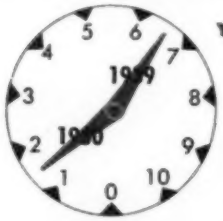

YESTERDAY...

The total capacity of all boiler feed pumps built and installed by Pacific during the year 1930 was 15,000 KW. In 1939 it was only 65,000 KW.

The first Pacific boiler feed pump for central station service was built in 1940...the first for marine service in 1944. The total capacity of all Pacific boiler feed pumps built in 1950 was 4.75 million KW.

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ideas . . . tools . . . methods . . . devices

New equipment and methods that improve production only a little are of big value in overall plant economy.

Circle Cutting Attachment for Bandsaws

A CIRCLE cutting attachment for bandsaws which permits cutting of circles and radii without layout has been designed by *C. C. Johnson*, an employe in the woodshop at *Texas Engineering and Manufacturing Company, Inc.*, Dallas, Texas, where use of the tool has effected an average reduction of 90 per cent in the man-hours required to produce discs and other wooden items having one or more curved dimensions.

Quantities of as many as 200 different parts of this nature sometimes are required by TEMCO in a single month. Uses range from cover plates for holes left in aircraft engines when accessories have been removed to shipping crate cradles and stool tops.

Tool Design

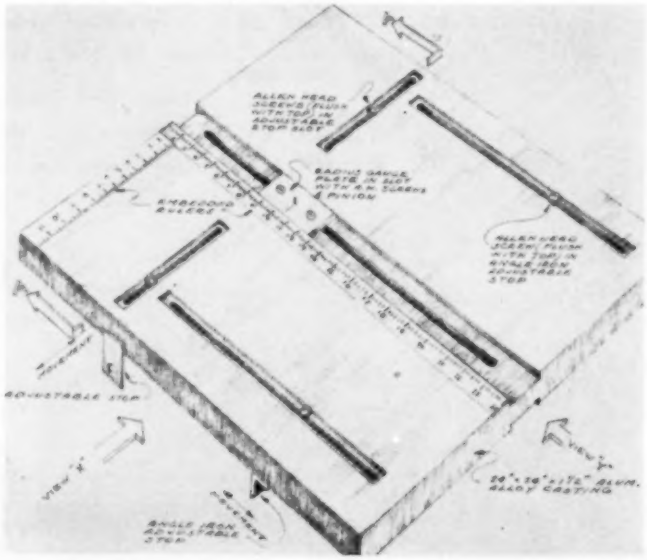
Johnson's jig is easily handled by one man; and only two or three minutes are required to set it up and put it into use. The tool consists of an auxiliary table 24 in. square and $1\frac{1}{2}$ in. thick, which is placed on top of the regular bandsaw table and secured with two thumb screws. A movable radius gauge pin on the auxiliary table acts as a pivot on which the operator revolves the wood from which the circle is to be sawed. This pin is positioned by use of two scales scribed at right angles to each other on the top surface to permit squaring the wood, thus centering the radius gauge pin. The wood is then pressed against the needle-sharp pin, and the jig is set for the accurate cutting of any number of circles of the same dimension without layout or resetting the jig.

Improved Method

Previous method of sawing the circles was to layout the pattern with a pencil, saw outside the line to allow for inaccuracies resulting from hand feeding of the wood to the blade, and then dress the curved side on a sander, a time-consuming process which had to be repeated many times on large jobs.

C. C. Johnson, of Texas Engineering and Manufacturing Company's woodshop, designed the bandsaw cutting attachment.

Device, consisting of only six major components and produced at very low cost, will handle circles up to 48-in. in diameter.



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by solving the problems of

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- VIBRATION
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- FLECTION
- EXPANSION and CONTRACTION

And when the advantages of Blaw-Knox Functional Type Spring Hangers and Vibration Eliminators are used in conjunction with *Blaw-Knox Prefabricated Piping* you get (1) Joints located in zone of lowest bending movement (2) A reduction in number of joints (3) More desirable steam flow characteristics (4) Savings of lineal feet of pipe (5) Better force and stress relationship . . . in other words, a simplified, more efficient piping system.

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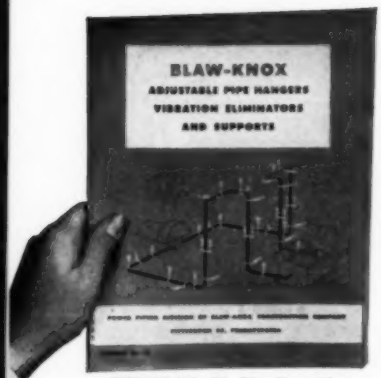

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BLAW-KNOX

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VIBRATION ELIMINATORS

Welding Bench

MANY welders persist in placing the welding job on the floor—especially for flat work. This makes it necessary for the operator to stoop, or assume other uncomfortable positions.

This may be avoided by constructing a welding bench made of 2 in. welded pipe, of a size necessary to meet individual needs, and covering it with sheet metal, or boiler plate. If space is limited it may be more convenient to construct a number of smaller benches, which in case of need can be placed end to end, or side by side.

The use of 2 in. pipe assures a bench of sufficient strength to carry a heavy welding job. Obviously, the height of the bench depends entirely on the type of welding jobs performed, and the preference of the welding operator. The top of the bench is covered with a piece of sheet metal, preferably boiler plate of from ¼ in. to ¾ in. thick.

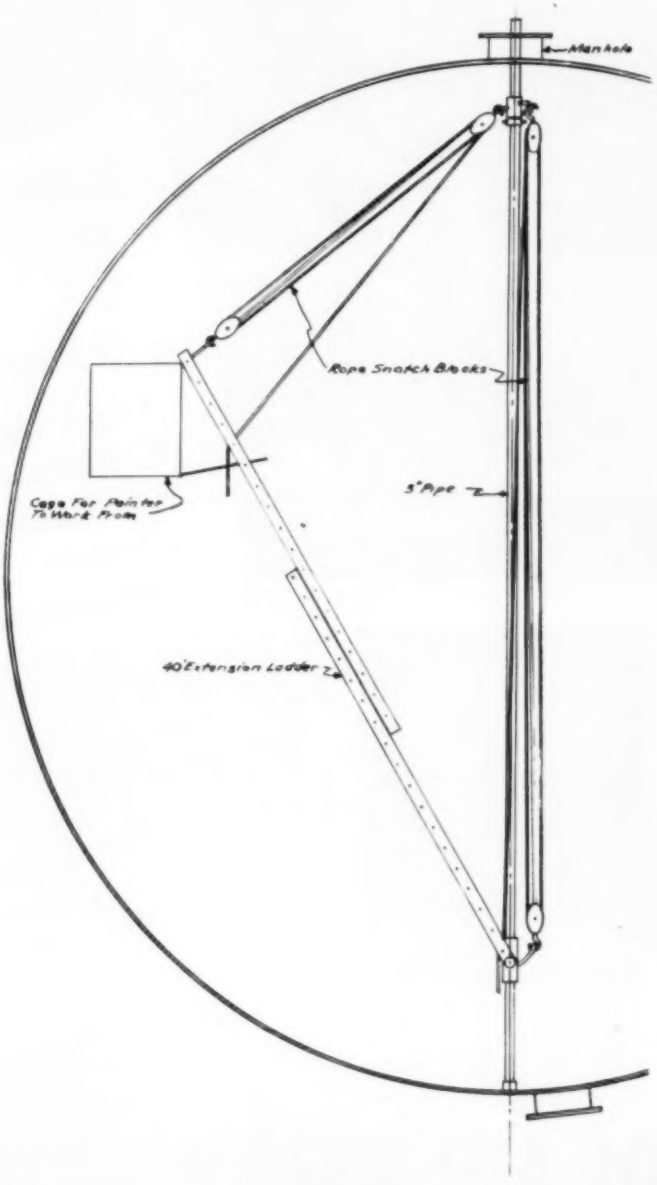
Such benches are suitable for any type of welding and where electric welding is used, an added convenience is the fact that a permanent ground can easily be made to the welding bench.

Portable Scaffold For Ball Type Tanks

TO save maintenance time and labor, we devised the illustrated portable scaffold for sand blasting and painting ball type tanks. The scaffold is built on a revolving gin-pole with three adjustments for the working cage allowing complete coverage of a ball type tank with minimum time and effort.

The gin-pole consists of a 3-in. pipe extending through the top manhole with sleeve connections for steadiness. A sleeve, spot welded to the bottom of the tank, allows the gin-pole to pivot. The sleeve is left in the tank for future use. Two rope blocks are required for two of the adjustments of this scaffold.

A cage constructed of ¾-in. pipe with 2-in. wood floor suspended from the end of a 40 ft aluminum extension ladder constitutes the working area. The pivot base of the ladder is made of 3-in. pipe with 4-in. sleeve to revolve on the gin-pole. Scaffold is constructed for entrance to the tank through a 16-in. manhole.—*E. C. Jennings, paint foreman, Phillips Petroleum Company, Phillips, Texas.*



Data, courtesy Wm. F. Lowe, Secretary, Natural Gasoline Association of America, Tulsa, Oklahoma.

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Lunkenheimer Breech Lock Valves are built to control steam and water at high pressures and temperatures with absolute safety and freedom from leakage. The patented disc is flexible and resilient to assure tight seating and prevent sticking when in the closed position. The body and bonnet are locked together like the breech mechanism of a large gun. Internal pressure loads are carried by the inter-locking breech lugs, and the joint is made pressure tight by a seal weld. Gaskets, threaded rings and bolts are eliminated. The bonnet joint can be readily disassembled and reassembled.

WRITE FOR the address of your nearest Lunkenheimer representative, who will give you full details and make specific recommendations. The Lunkenheimer Co., Box 360EE, Cincinnati 14, Ohio.

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Adjustment of Smoke Indicator

WITH the rapidly increasing use of electronic equipment the question of focusing the light elements becomes a more frequent problem for the engineer. The light ray must be accurately centered on the electric eye and the intensity of the light is of great importance.

Recently, I had occasion to correct the adjustment of a smoke indicator. The beam was projected through a 4 in. pipe twenty-one feet long. By removing the electric eye unit, the light could be seen but it was so bright and the space so restricted that it was difficult to judge the center or intensity. In the absence of any other light measuring instrument, I used an exposure meter having a photo electric cell. By holding this over the open end of the pipe and trying sidewise movement of the light it was possible to find the point of best light.

After this adjustment was made, it was found that the light was not bright enough. Calling on the exposure meter again, the lamp was moved back and forth until the proper setting was obtained. By this method we were able to increase the deflection of the meter 100 per cent and the indicator adjustment was perfect. Exposure meters are so common that it is easy to own or borrow one.—*H. K. Wilson, St. Petersburg, Florida.*

To make sound and dependable welds

Pick the Right Welding Method

data courtesy The Linde Air Products Company

Hints for welding gray cast iron, low and high-carbon steels, wrought iron, lead and white metal. Braze welding methods are also discussed.

WELDS in some metals require preheating. Others do not. Some metals can be welded without flux, other metals require flux. In some metals, such as cast iron, the molted puddle is large and fluid. In lead or white metal the puddle is pasty and mushy.

The following data, listing important points, will help welding operators pick the right welding method for each of a number of common metals. The information given is for fusion welding. All the metals listed, except aluminum, can also be braze-welded. In addition, many other metals, such as malleable iron, galvanized iron, Monel, and nickel can be joined by braze-welding. Because braze-welding methods are the same for all metals, the important points are discussed at the end of the article.

GRAY CAST IRON

Preheating—Cast iron must be preheated before welding. Small parts can be heated with a blowpipe flame. Large parts require a firebrick furnace.

Flame Adjustment — Adjust the blowpipe for a neutral flame. Use a tip one size larger than for the same thickness of steel.

Welding Rod—A cast iron rod, high in silicon and low in sulphur will give the best results. Certain elements in cast iron such as silicon, tend to burn out during welding. The rod should contain sufficient silicon to insure the proper amount of this element in the weld metal. Oxweld No. 9 Cast Iron Rod meets all these requirements.

Flux—A flux is needed in welding cast iron to float out the oxide coatings. When white specks appear in the puddle, it is a sign that more flux is required. These specks are oxides and if not removed will cause unmachinable hard spots in the weld.

Puddle—Molten cast iron is extremely fluid and tends to remain fluid for a long time. The experienced operator, however, has no difficulty in controlling it, and usually maintains a much larger puddle than with any other metal. Because it is so fluid, cast iron must be welded in the down-hand position. It is difficult to weld vertically and overhead. Backing up the weld with carbon blocks or carbon paste will help make the job less difficult.

Making the Weld—Let the tip of the inner cone just touch the metal, moving it in a circular motion so that both sides of the vee and the welding rod will melt at the same time. Moving the blowpipe in this way will also help carry a good heat around the weld area. Do not stir the molten puddle with the welding rod and do not let the rod drip into the weld drop by drop. Once the weld is started, carry it through to completion as rapidly as possible. Do not rework the weld without adding rod.

Treatment after Welding — When welding is completed, reheat to a dull red, cover with asbestos paper, close

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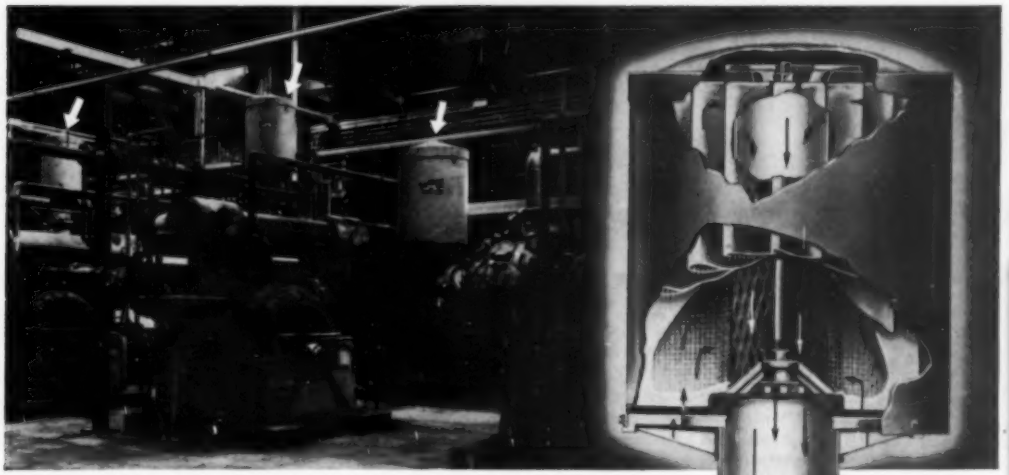

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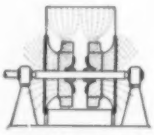
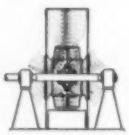


How P-D split wheel assists diffusion—aids distribution throughout the fan.



Conventional double wheel with common disc produces concentration, results in poor diffusion.

Performance ratings of the Prat-Daniel F-D Fan are established according to the Standard Test Codes adopted by N.A.F.M. and the A.S.H.V.E.

Design characteristics provide unusually high conversion of Velocity Pressure to Static Pressure. This is accomplished by streamlined inlet cones that are larger in proportion to the wheel than are usually found in forced draft fans. The unusual depth of the cones provide a wider housing than would customarily be used, increasing the space available for diffusion. Precisely fashioned backward curved blades provide a nearly perfect aerodynamic flow across both leading and trailing edges. Double wheel fans are spaced apart to permit four way diffusion of air, further contributing to this conversion. Peak efficiency and horsepower curves fall well within normal fan selection range, offering the optimum in maximum efficiency and non-overloading characteristics.

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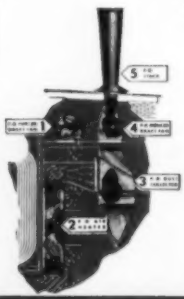

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Welding Techniques

(Continued)

the draft ports in the preheating furnace. Do not disturb until the casting is cold, or, if the casting is small, bury it in an annealing bin.

LOW-CARBON STEEL

Preheating — Preheating is not necessary because of the strength and ductility of steel. However on heavier materials, preheating will help hold the welding heat.

Flame Adjustment—A neutral flame should be used for welding ordinary low-carbon steel. Other flame adjustments can be used to weld certain special steels.

Welding Rod—The rod to use depends upon the physical properties desired in the finished weld. Oxweld No. 1 H.T. Rod will produce welds of good ductility with tensile strengths from 10 to 25 per cent higher than low-carbon steel base metal.

Flux—Iron oxide readily floats to the surface of a steel weld since its melting point and specific gravity are considerably lower than those of molten steel. Therefore no flux is required.

Puddle—Fusion is confined to a small area directly under the flame. The metal is not very fluid until it is thoroughly molten—that is, there is a soft or "mushy" range between the solid state and the liquid state. This is of great value in controlling the puddle, especially when welding a vertical seam or welding directly overhead.

Making the Weld—Hold the blowpipe and rod at an angle of about 90 degrees to each other. Each will form an angle of 45 degrees with the surface of the work. The end of the inner cone should not quite touch the metal. Dip the end of the rod into the puddle, and let it rest on the bottom of the puddle area below the surface of the puddle. As the rod melts move it from side to side in the puddle.

Treatment after Welding — The small amount of oxide that forms during welding remains on the surface as a scale, and can be easily removed when cold. Heat treatment after welding is not required.

HIGH-CARBON STEEL

Preheating—Preheating is usually desirable in order to complete the weld as quickly as possible once it is started. Preheating will also help avoid expansion and contraction cracking, as well as cracking from rapid cooling.

Flame Adjustment—The flame should have a strong excess of acety-

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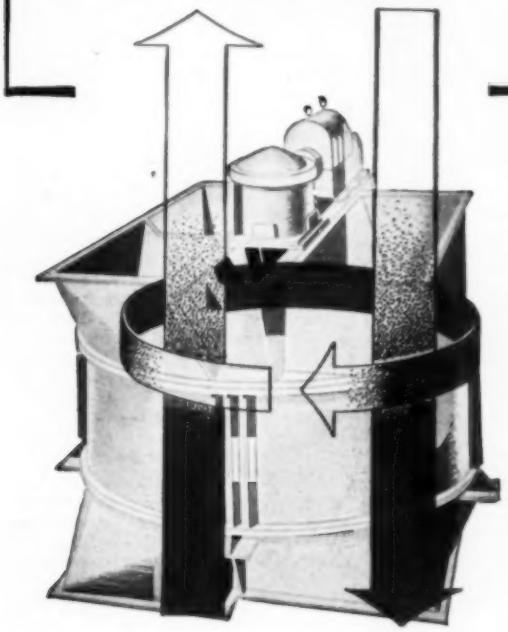

Here indeed is impressive evidence of the wide acceptance of the Ljungstrom air preheater. Since the war the total capacity of steam generating units equipped with Ljungstrom air preheaters, installed, under construction or on order in industrial and utility plants throughout the country comes to well over 285,000,000 pounds of steam per hour.

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Welding Techniques

(Continued)

lene. An oxidizing flame, or even a neutral flame, tends to burn out the carbon in the steel and thus change its physical properties.

Welding Rod—For thin sections a relatively low-carbon rod with certain alloy additions to increase strength can be used. Oxweld No. 32 C.M.S. Rod is in this class. For heavier sections or parts that are to be subsequently heat-treated Oxweld No. 6 Chrome Molybdenum Rod is recommended.

Flux—No flux required.

Puddle—Use only just enough heat to obtain fusion between the rod metal and the base metal and thus avoid overheating the base metal. Bubbles rising in the puddle indicate the formation of carbon dioxide gas and are usually a signal that the flame needs adjustment. Be sure to work the bubbles out thoroughly as they will cause blowholes if they become entrapped.

Making the Weld—The backhand technique of welding is usually preferred, using a minimum amount of heat. If the flame is withdrawn slowly after each pass, it will help to avoid blowholes. Finish the weld as quickly as possible and do not remelt or rework the weld metal if it can possibly be avoided.

Treatment after Welding — Most parts made of high-carbon steel have certain properties that were imparted to them by special heat-treatment. These properties are more or less altered in the neighborhood of the weld and additional heat-treatment is necessary to restore them.

WROUGHT IRON

Preheating—Wrought iron, like low-carbon steel, does not need to be preheated before welding because of its strength and ductility.

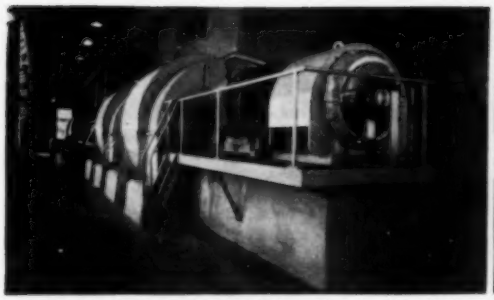
Flame Adjustment—A neutral flame should be used.

Welding Rod—Best results are obtained with a rod that has neither high-carbon nor high-alloy additions. Oxweld No. 1 H.T. Rod is ideal.

Flux—No Flux is needed.

Puddle—The puddle will be pasty rather than liquid. Will not flow readily. Avoid stirring the puddle with the rod.

Making the Weld—Because of its high melting point, about 2,750 F, wrought iron requires much heat. As the metal is heated, the slag in the iron will melt first to give the surface a greasy appearance. Continue to heat until the base metal really begins to melt.



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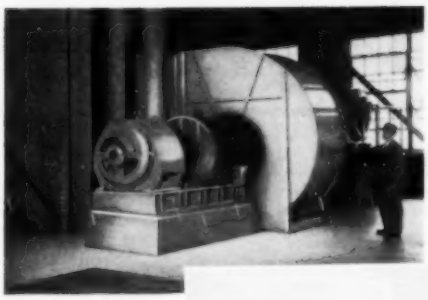

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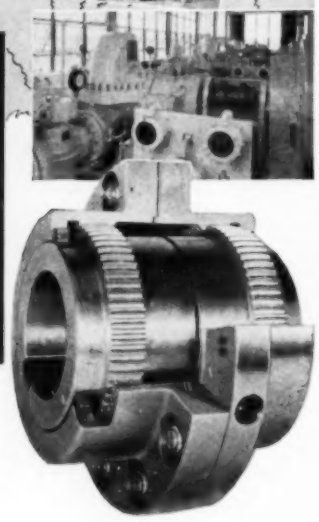

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Welding Techniques

(Continued)

Treatment after Welding — None needed.

LEAD

Preheating — Preheating is not necessary.

Flame Adjustment—Because of the low melting point of lead, only a small amount of heat is required. Use a tiny flame adjusted to contain a slight excess of acetylene.

Welding Rod—Welding rod may be made by cutting sheet lead into strips or by melting some lead and casting it into rods of convenient size. Always scrape the rod clean just before welding.

Flux—No flux is needed.

Puddle—Keep the puddle small. Lead has a low melting point and a large puddle can get out of control easily.

Making the Weld—Hold the flame almost perpendicular to the surface of the metal. The inner cone should almost touch the metal. Heat the lead until it just begins to melt, then add a drop of metal from the rod. Add the rod, a drop at a time, across the joint.

Treatment after Welding — None needed.

WHITE METAL

Preheating—The part needs to be warmed with the blowpipe before welding.

Flame Adjustment — Adjust the blowpipe to a slightly excess acetylene flame. Use a small tip.

Welding Rod—Use a commercial white metal welding rod. This can be obtained from your local welding supply jobber. Remove oxide coating just before welding.

Flux—No flux is needed.

Puddle—The base metal will become mushy but not fluid. White metal has a low melting point and one must be careful to keep the heat low.

Making the Weld—Remove oxide, plating, and dirt from the area to be welded. White metal melts at 800 F, but oxide and plating melts at 2100 F. If you try to melt them the casting may collapse. Warm the part, then concentrate the flame on the surface of the break. When fine drops appear the casting is ready to weld. The metal will be mushy. Hold the blowpipe so the inner cone is about ½ to ¾-in. away from the metal. Add molten rod and build up the weld.

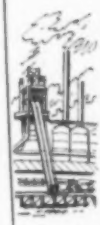
Treatment after Welding — None needed.

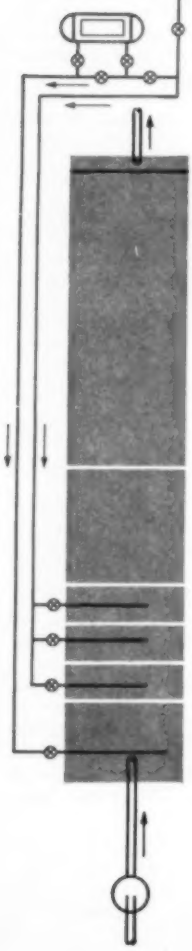
BRAZE-WELDING

Preheating — Slight preheating is

One of a series of case histories from the records of Hall Laboratories, Inc.

THE CASE OF THE CONTAMINATED WATER AND THE UNKNOWN FACTOR





Waste water in this industrial plant was contaminated by certain solids and phenol and cyanide. Concentrations of these materials were too great to permit discharge into the river without treatment.

The alternatives were:

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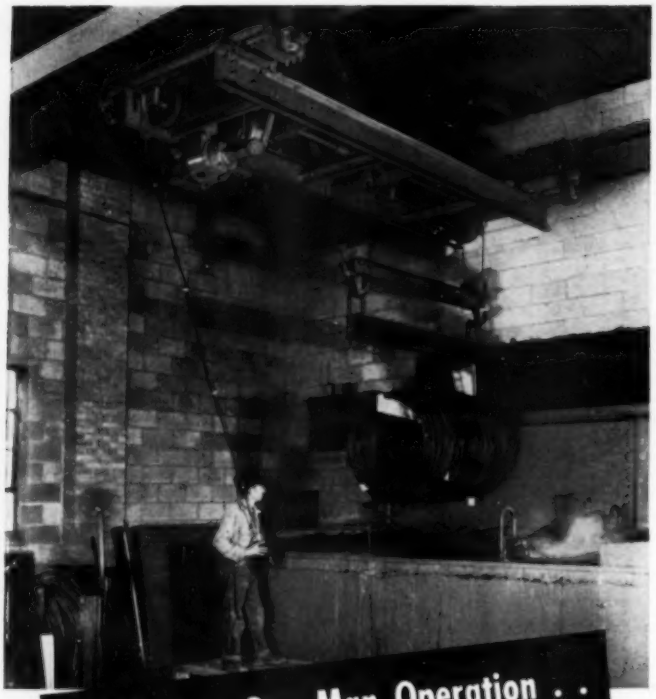

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Welding Techniques

(Continued)

necessary but the temperature of the part need be raised only to a "black" heat.

Flame Adjustment — The flame should be adjusted for a slight excess of oxygen. To get the proper flame, first adjust to neutral and then reduce the amount of acetylene. Correct flame adjustment is important.

Welding Rod—As the strength of a braze-welded joint depends directly upon the quality of the rod, it is important to use the best rod available.

Flux—A good flux is needed to clean the surface of the base metal chemically. Dip the heated rod into the flux can often.

Puddle—The base metal is not melted and the puddle contains only bronze rod metal. The base metal must be cleaned of grease, rust, and dirt to allow the puddle to spread smoothly over the surface. This is called tinning.

Making the Weld—Heat the base metal only to a dark red. Apply a little fluxed rod. If the metal is clean and at the proper temperature, the rod will tin easily. If the metal is too hot the molten rod metal will bubble. If the metal is too cool the molten rod metal will ball up and won't spread. Keep the end of the rod in the puddle when you add rod.

Treatment after Welding—Cover the finished job with asbestos to keep off drafts of cool air.

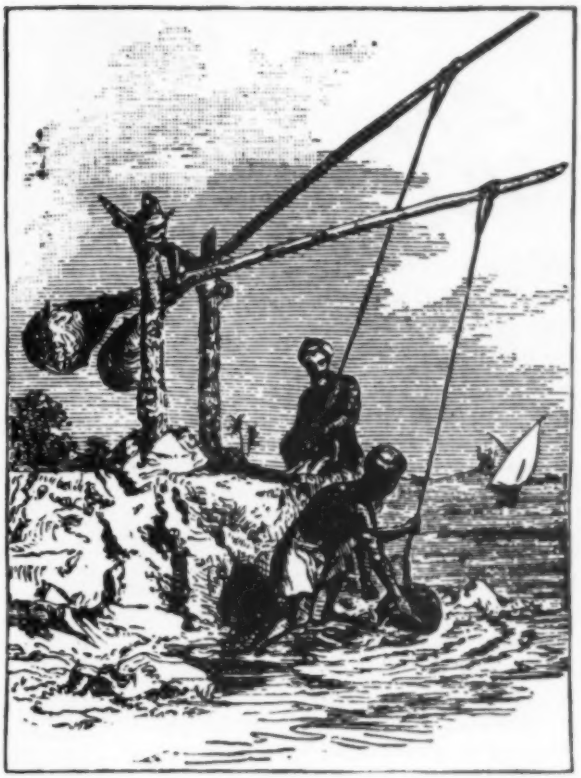
Meter Lifting Tool

IN a shop specializing in testing and repair of small domestic type gas meters, one ingenious shop hand devised a lifter from a pair of conventional ice tongs, to facilitate the task of lifting the meters from floor to testing bench, etc.

In making the lifter, the sharp points of the tongs were cut off, and two flat steel plates recessed with slots slightly wider than the diameter of the intake and outlet risers on the top of the meter were welded.

Using two such tools, a man can carry two meters at a time—one in each hand—thereby saving time and effort. — GEORGE SIMON, KANSAS.

The Pump that wasn't a pump



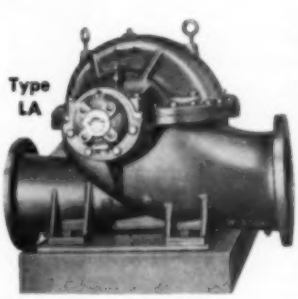
For many years this peculiar looking contrivance was the most efficient means known for moving water from one level to another—but it wasn't really a pump, it was a "shadoof".

Though still used today in many parts of the world, this hand-operated "bailing lever" is said to have been used 3000 years ago by the ancient Babylonians. On the basis of six strokes a minute, with a bucket that held 60 pounds of water, it could raise 36 gallons per minute. Those "bags" on the short end are used as counterpoises to lift the filled vessels.

If this were 3000 BC and you were looking for a pump for *any* purpose, the best Worthington could do for you would be to recommend a shadoof. The drive? Only *one* available—a husky slave.

Almost fantastic, isn't it, that crude devices like the shadoof, the mechanical innovations of their day, were the starting points for modern Worthington pumps—centrifugal pumps that can move as much as 250,000 gallons per minute; individual designs with 100,000 standard combinations of capacities, heads, casings, and mountings for *any* drive available; single-stage, multi-stage, volute, turbine, horizontal, vertical, Mixflo, Axiflo and regenerative pumps—for virtually every need of utilities, petroleum, paper, sugar, food, chemical, marine, water works, metal-working, and many other industries.

Yes, there's a Worthington pump for your requirement—a pump that's *standard* with Worthington. To find out about it, consult your nearest Worthington District Office or write to Worthington Pump and Machinery Corp., Centrifugal Pump Div., Harrison, N. J.



When you buy Worthington centrifugal pumps—the most complete line you'll ever find—you'll always be assured of the *right* pump for every job. Typical of this broad Worthington line is this large LA (to 60,000 gpm) at left; monobloc DN pump (to 2500 gpm), center; and the CN, frame-mounted version of the DN, in over 10,000 combinations.

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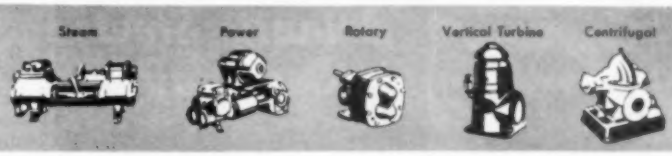

IF THERE is anything a salesman had rather do than sell, it's to sell some more.

But in these mixed-up days of steel shortages, it's not a matter of selling, or even order taking.

Our salesmen are devoting their time attempting to untangle various government regulations for our customers; helping customers arrive at suitable substitute steels; advising them on availabilities; helping make allocations on a fair and equitable basis.

They are trying their best to keep the customer satisfied—as satisfied as one can be under the conditions—because we hang onto the idea that it will pay off in the long run.

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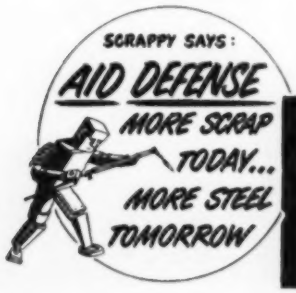

WAREHOUSE DIVISION
Atlantic Steel Company
ATLANTA, GEORGIA • EMERSON 3451

Water Conditioning

(Continued from page 76)

Q—What is meant by carryover, foaming, and priming when referring to boiler operation?

A—These three terms, carryover, foaming, and priming are closely associated and all of them describe conditions which cause carryover or entrainment of boiler water solids in the steam. Foaming refers to the condition which results in the formation of bubbles on the surface of the boiler water. The foam causes boiler water solids to carryover with the steam. Priming is more violent and spasmodic action which results in throwing slugs of water over with the steam. Carryover is the continuous entrainment or carrying over of relatively small quantities of boiler water solids with the steam. Carryover is sometimes used incorrectly to describe all three conditions.

Q—What is self-purging water?

A—A self-purging water is one in which the hardness is temporary carbonate hardness caused by calcium and magnesium bicarbonate. These salts will decompose upon heating. They give off CO_2 and form the normal insoluble carbonates. This type water must be heated to above 190 degrees F in a well vented space so the gas evolved has a chance to escape.

Q—What is a cold process softener?

A—A cold process softener employs lime and soda ash or other chemicals to soften the water. They may be of three types: (1) Intermittent or batch type; (2) Continuous, sedimentation type; (3) Continuous, sludge contact type.

The batch type consists of a tank or basin for mixing the lime, soda ash or other chemicals with the water. The tank or basin is filled with water, the chemicals are added and the batch is agitated or stirred for a period of 15 minutes to an hour. The mixture of water and chemicals is then allowed to settle for as long a

How to get Slip-proof Slap-proof Shock-proof power transmission at high speeds

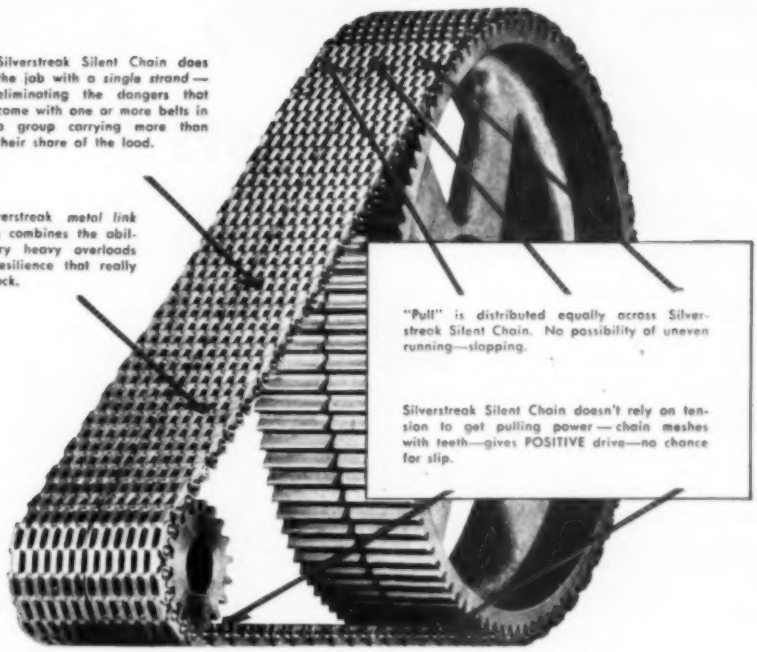
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Fig. 4001/6561. Duplex unit consisting of Straightway Lever-operated Sealing Valve and Angle Blowing Valve.

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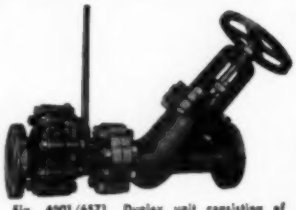

Fig. 4001/6571. Duplex unit consisting of Straightway Lever-operated Sealing Valve and Y Blowing Valve.

Fig. 6571/6561. Duplex unit consisting of Y Sealing Valve and Angle Blowing Valve.

Fig. 6561/6571. Duplex unit consisting of Angle Sealing Valve and Y Blowing Valve.

Everlasting Valves

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EV-548

FOR EVERLASTING PROTECTION

(*Starts page 74*)

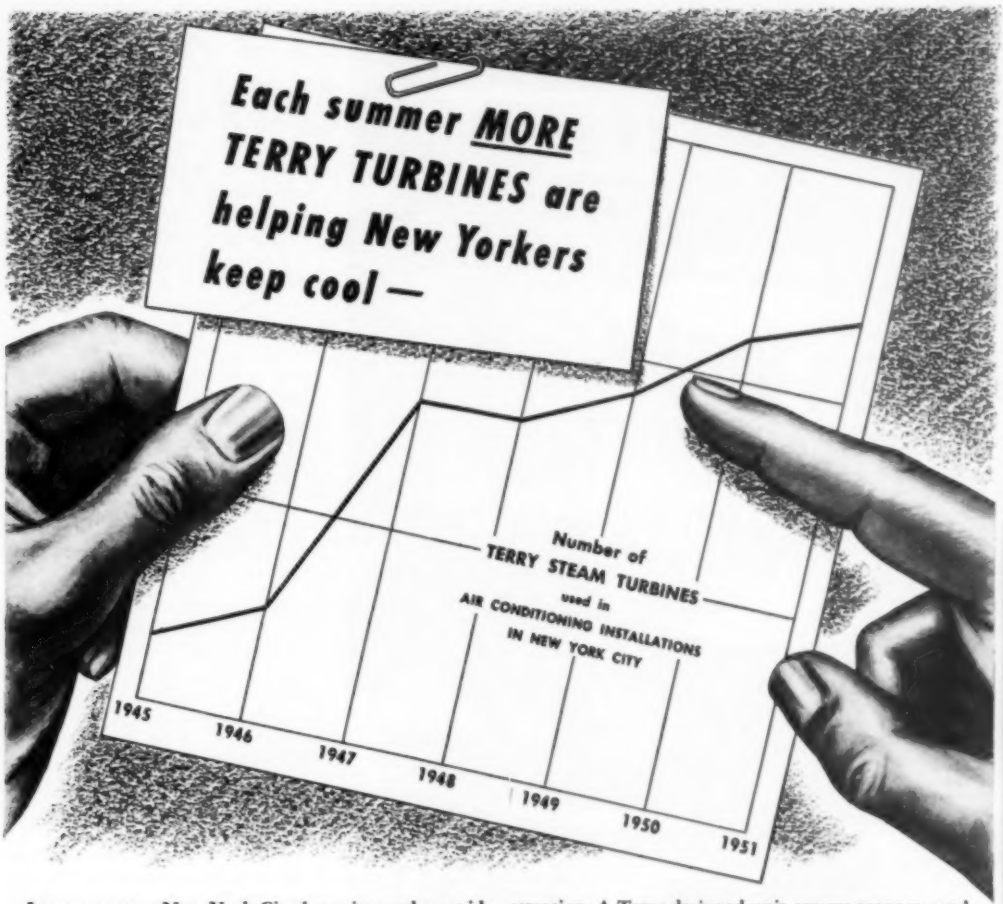
time as possible. The clear softened water is decanted off the top by using a swing pipe and discharged through gravity type filters to enter the system.

The continuous, sedimentation process is one in which the chemicals are being added continuously with the raw water and thoroughly mixed. From the mixer the slurry flows to the flocculator basin where slow rotating blades continue agitating the mixture to insure formation of the proper size of floc. From the flocculator the slurry flows to the sedimentation chamber designed to allow approximately four hours settling time. From this section of the softener the clear effluent flows continuously from the top to the filters or system. Various types of sludge blow-off systems are employed.

The continuous, sludge contact type of cold process softener has the raw water entering through a sludge bed of soda ash, lime, and coagulant. The initial precipitation of calcium and magnesium occurs here and joins the slurry pool of previously formed precipitates of calcium and magnesium by contact. The newly formed solids deposit on the slurry already present by accretion. The water is filtered through a bed of its own sludge. The entire tank volume is constantly and slowly agitated as the process continues.

Q—What is continuous hot process softening?

A—Continuous hot process softeners are used for specific external treatment of boiler feed water. These softeners are designed to operate at temperatures of 212 F and above and use either live steam or exhaust steam for heating. Hot process softeners are of two types, the sludge blanket type and the conventional sedimentation type. Both types are continuous in operation. Many details of design and operation vary but the principles involved are the same. The flow of raw water



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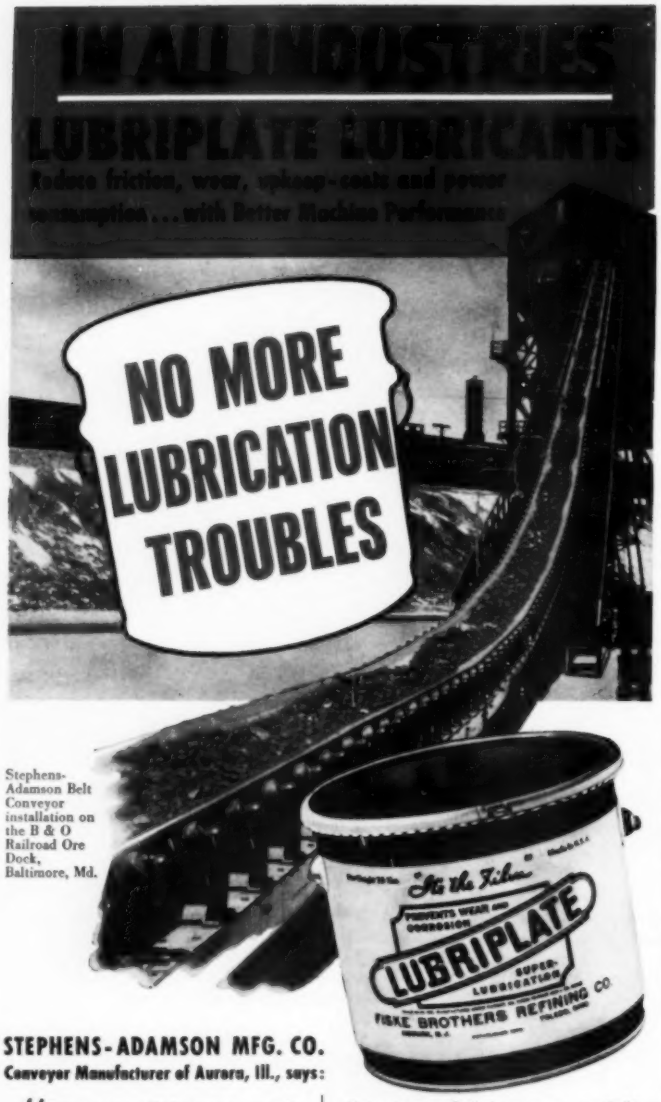

Stephens-Adamson Belt Conveyor installation on the B & O Railroad Ore Dock, Baltimore, Md.

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LUBRIPLATE *The Modern Lubricant*

Water Conditioning

(*Starts page* 74)

to the softener actuates a chemical proportioning device which continuously feeds lime, soda ash, and coagulant in proportion to the amount of water entering the softener. Chemical reactions to form calcium carbonate and magnesium hydroxide are almost instantaneous and due to the high temperature, sedimentation or settling of the floc takes place rapidly. Sludge can be blown off intermittently or continuously either by manually or automatically operated valves. Recirculation of sludge and automatic blowdown make economies in operation possible.

Q—What is the advantage of hot process over cold process softening?

A—Hot process softening is more efficient than cold process because the heat speeds the reaction of the chemicals and speeds settling. The average effluent from a hot process will have a hardness of 15 to 30 ppm while cold process effluent will probably have an effluent of from 45 to 70 ppm hardness if used on water having the same original hardness. The heat used in a hot process softener tends to remove some of the temporary hardness without chemicals and will drive off oxygen and CO_2 if the softener is properly vented.

Q—What are Zeolites?

A—Zeolites or Zeolitic materials are solid substances of a complex chemical structure which have the property of reacting with various ions in water with which they come in contact. The chemical reactions are those of replacement. That is, certain ions are replaced with an equal number of other ions of like charge.

Q—What is sodium zeolite softening?

A—Sodium Zeolite softening deals with the particular reactions of zeolitic materials in which all cations or two or more positive charges are removed from solu-

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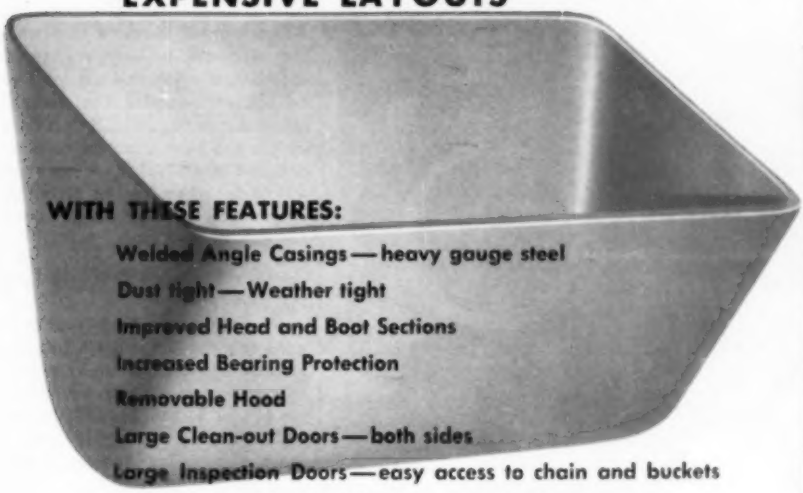

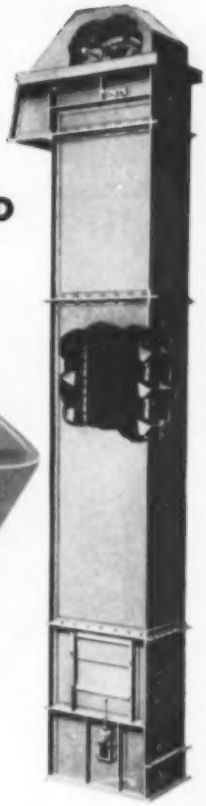

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DART UNIONS

Water Conditioning

(*Starts page* 74)

tion and are replaced by sodium ions.

Q—What are the two principal cations removed from normal water supplies by sodium zeolite?

A—The two principal cations removed from normal water supplies are calcium and magnesium. When zeolites react in this way, they are said to be operating in the sodium cycle and are said to be sodium zeolites. The zeolites operating in the sodium cycle are by far the most common used today and are usually the ones referred to when Zeolite softening is mentioned with no further qualification or limitation.

Q—Why is sodium Zeolite softening used?

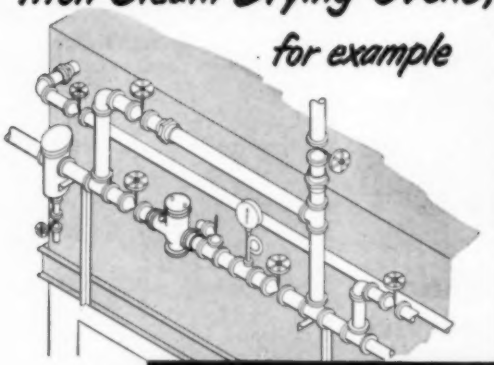
A—Sodium zeolite softening is used to remove the scale forming calcium and magnesium by replacing these ions with an equivalent amount of sodium ions. It is also used quite extensively in preparing water for laundry use, industrial processing and cities for reducing the hardness of municipal water supplies. It is now used quite extensively for softening home water supplies where the city does not soften the municipal supply.

Q—How are Zeolites obtained?

A — Carbonaceous Zeolite is made from sulphonated coal and can be operated on the sodium cycle. Zeolite is also found in nature and is obtained from gluconite beds. These must be processed before use. Natural Zeolite is known as greensand. Zeolites are of complex chemical structure and usually consist of sodium alumium-silicate. These are silicious zeolites. Zeolite can be made synthetically. Some of the synthetic zeolites have a much higher exchange capacity than do those found in nature. A new Zeolite has recently been developed which can be used on hot water. Most Zeolites will not tolerate hot water, but must be used on cold water.

Are Your Pressure Regulators Doing As Well?

...on Steam Drying Ovens, for example



THE INSTALLATION

In steam supply line to battery of 2 drying ovens at Ferro Chemical Corporation, Bedford, Ohio. Ovens individually controlled by thermostatic valves.

THE HISTORY

Specifications called for a valve to reduce initial steam pressure of 70 psi to 13 psi, and to maintain reduced pressure automatically without significant fluctuation whether one, or both, or neither oven is operated. Ovens to be operated at same or different temperatures, depending on process requirements.

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SUITABILITY:	Does everything claimed for it
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OPERATING RESULTS:	No fluctuation of oven heat
PRICE:	Good buy
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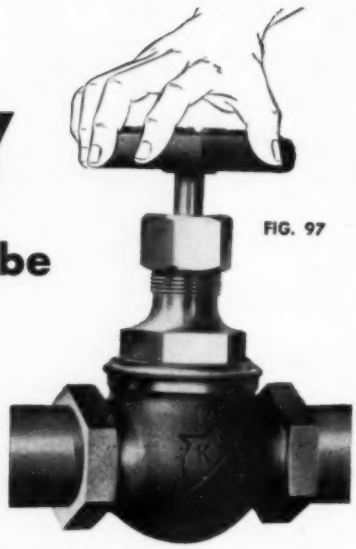

FIG. 97

JOB-FITTED with the *right* disc for every service

FIG. 98

TO ASSURE LONG, TROUBLE-FREE OPERATION with easy maintenance, the complete KENNEDY Line is *job-fitted* . . . every valve specially designed and engineered for the job it has to do.

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Water Conditioning

(*Starts page 74*)

Q—Can Zeolite softening be used in preparing boiler feed water?

A—Yes, Zeolite softening can be used for boiler feed water treatment and it often is used. The effluent from a Zeolite softener is very low in hardness, containing zero or nearly zero hardness. Zeolite softeners are easily operated and low hardness in the effluent can be obtained with proper operation with very marked reduction in scale forming properties.

Q—What are some of the disadvantages of sodium Zeolite softening?

A—1. Waters of very low or very high pH should not be used in a Zeolite softener as they destroy the Zeolite.

2. Waters having high turbidity (that is, containing suspended matter), should not be used through a Zeolite bed, because the suspended material will clog the Zeolite bed.

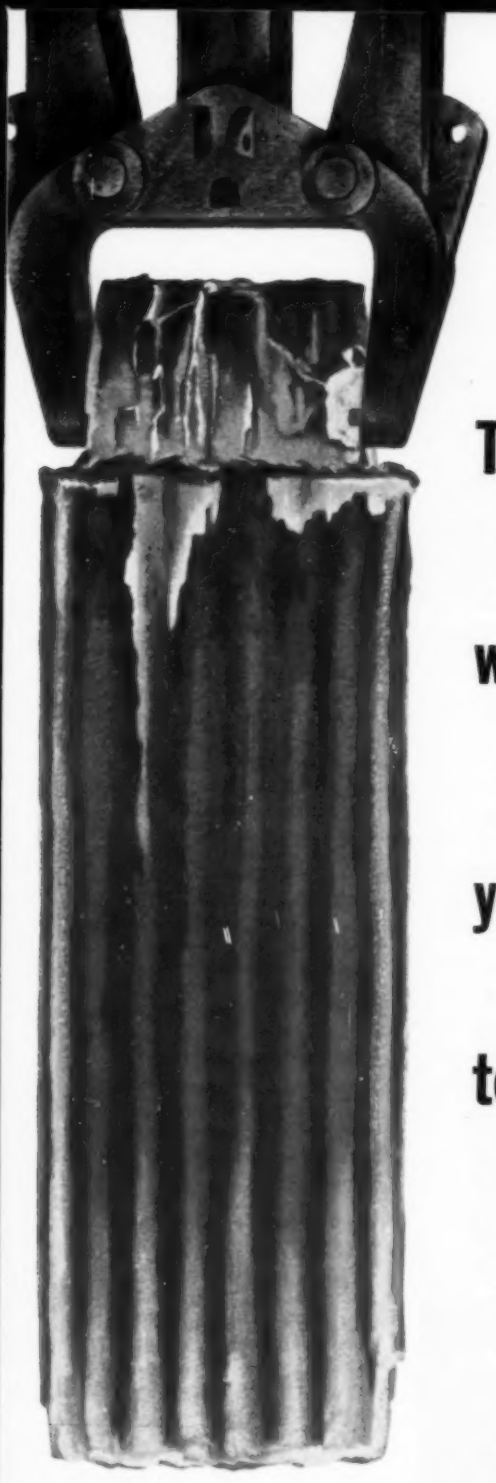
3. Ferric iron is harmful to Zeolite beds.

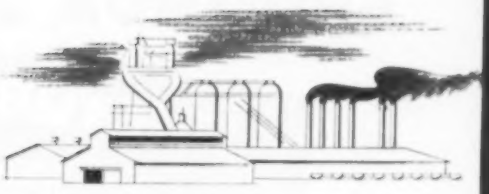
4. Hardness is removed without reduction in alkalinity or total solids.

5. If silica is a problem, there is danger of increasing the silica in the water unless a non-silicious Zeolite is used.

6. Unless the natural alkalinity of the water is low in comparison with total solids, Zeolite softening results in high boiler water alkalinities. Higher boiler alkalinity requires a high rate of blowdown. High alkalinities promote caustic metal embrittlement and carryover.

7. In some cases the operation of a Zeolite softener may prove more expensive than a lime-soda softener, especially if most of the hardness in the natural water is in the carbonate form, which can be precipitated by lime. 3.5 pounds of salt are required to regenerate a Zeolite bed for every pound of hardness removed, while .8 of a pound of lime will precipitate a pound of carbonate hardness.





They did

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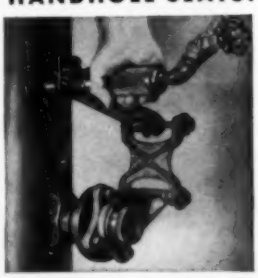

Y-305

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8. Zeolite softened waters are corrosive, since all but a small part of calcium has been removed. It requires a high pH to counteract this corrosive tendency.

Many of the above disadvantages can be overcome by newer methods using other types of zeolites operating differently than in the sodium cycle. The above apply to sodium zeolite. A thorough study of the natural water and operating conditions should be made prior to buying any water conditioning equipment.

Q—What is hydrogen zeolite?

A—In the last six questions we have discussed Zeolite, which operates in the sodium cycle and which could be regenerated by using a common salt (NaCl) solution. Hydrogen Zeolite is the name given to a group of Zeolites, either natural or synthetic, which have the property of exchanging the hydrogen for the cations of calcium, magnesium, sodium, etc., when operated in the acid cycle. When the hydrogen zeolite bed is exhausted, it is regenerated with acid. Sulfuric acid is generally used for regenerating the bed. Hydrogen Zeolites are non-silicious organic materials. These non-silicious or carbonaceous Zeolites can also be regenerated by using salt and when salt is used in regenerating, they operate in the sodium cycle.

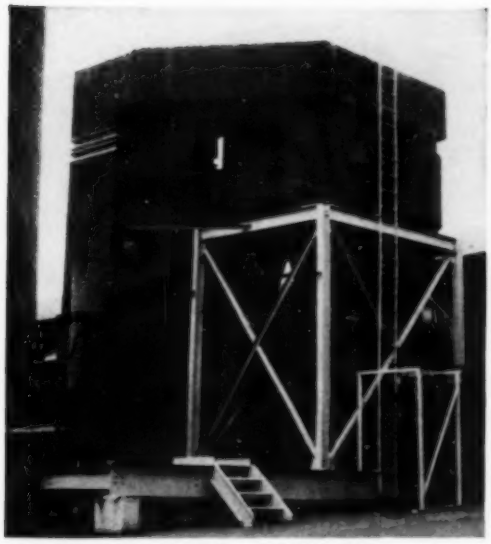
Q—What we do mean by external treatment of water, especially boiler feed water?

A—External treatment consists of the softening operation practiced or performed before the water enters the boilers or process equipment.

Q—What is internal treatment?

A—Internal treatment consists of feeding chemicals to the feed water going into the boilers or process equipment or feeding chemicals directly to the boiler drum or process equipment by using high pressure pumps of the metering type.

Q—Is internal treatment required when using a hot lime-soda ash softener for external treatment?



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● **LOAD ON BOILER CUT BY 75 HP** by trapping with Armstrongs, says Chief Engineer of large midwestern hospital.

● **30°-40° TEMPERATURE INCREASE** on 8-roll ironer after unit trapping with Armstrongs, reports large eastern laundry.

● **STARCH DRYER HEAT-UP TIME CUT 2-3 HOURS** after retrapping with Armstrongs, says Canadian plant engineer.

● **125 HP BOILER NOT NEEDED** — 80 HP boiler does the job since Armstrong traps were installed in a chemical plant in Iowa.

● **50% SAVINGS IN TRAP MAINTENANCE LABOR COSTS** since installing Armstrongs at midwest agriculture machinery plant.

● **COOKING KETTLE OUTPUT SPEEDED UP 30%** by Armstrong unit trapping at large canning plant.

. . . BIG EFFECTS from little traps! The "shadow" cast by a steam trap is multiplied in size by the number of traps in your plant until it grows to be a giant that you can't shrug off. Let your nearby Armstrong Representative show you how Armstrong Trapping can cut *your* fuel, production and maintenance costs. Call him today.

Write for STEAM TRAP BOOK —
36 pages of useful, how-to-do-it data. Free on request.

ARMSTRONG MACHINE WORKS 880 Maple Street, Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

(*Starts page 74*)

When using Zeolite external treatment?

A—Some internal treatment of boiler water is necessary when using either hot lime soda or Zeolite external treatment.

Q—What chemicals are usually used for internal treatment?

A—Internal treatment chemicals will depend upon the characteristics of the boiler feed water. The most frequently used chemicals are one of the phosphates, sodium sulfite, tannin, and colloid materials. In plants employing high pressure boilers, caustic soda or soda ash may be fed internally to keep the alkalinity of the boiler water in the proper range.

Q—What purpose does each of the above chemicals serve in the boiler?

A—Sodium Phosphate reacts with the residual calcium to form the insoluble calcium phosphate, which can be blown out through the continuous blowdown or the bottom blow down valves of the boiler. Sodium sulfite reacts with residual oxygen to form sulfate. Tannin is a colloid material, which tends to keep the floc, formed by further softening in the boiler drum, in suspension so that it will be blown out instead of settling on the heating surfaces. Colloid materials other than tannins act the same as tannin.

Q—What is the action of colloids in a boiler drum?

A—Colloids are substances that are so finely divided that it requires a microscope of very high magnifying power in order to observe the particles. These fine particles surround the floc and will not let it adhere to heating surfaces or other floc. They serve as bumpers to keep the floc particles from settling or adhering to other surfaces.

Next month the author will discuss water problems and solutions from the operator's viewpoint.

YOU CAN'T BUY A BETTER COAL SCALE THAN A RICHARDSON

..AND HERE'S ANOTHER REASON WHY..

INLET OPENING, 20" x 20"

This 400-square-inch opening, *exclusive with Richardson*, ensures positive coal flow and never a "hang-up"—even with wet coal. An even greater area at the conveyor belt, due to the angle of repose of the coal providing pressure relief, is a double guarantee of free flow. It is designed to guarantee the ultimate in dependable, on-the-job operation.

Write for bulletins, and remember . . .

YOU SPECIFY QUALITY WHEN YOU SPECIFY

Richardson

MATERIALS HANDLING BY WEIGHT SINCE 1902

RICHARDSON SCALE COMPANY
Clifton, New Jersey

Atlanta • Boston
Buffalo • Chicago • Cincinnati
Detroit • Houston • Minneapolis
New York • Omaha • Philadelphia
Pittsburgh • San Francisco • Wichita
Montreal • Toronto

8353

NEW EQUIPMENT for Southern Industry

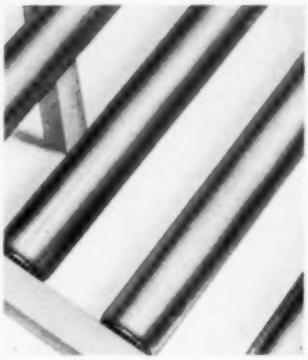
Coated Conveyor Rollers

D-1 SAMUEL MOORE & COMPANY, Mantua, Ohio, announces a new use for Dekoron plastic armored metal tubing in conveyor rollers subject to corrosive atmospheres or other severe conditions.

In cases where corrosive conditions are severe enough to warrant the use of stainless steel rollers, a considerable saving is effected because the plastic coating can be applied over ordinary carbon steel rollers and thereby render them impervious to the effects of moisture, salt, acids, alkalis, or other corrosive atmospheres.

Where the atmosphere is not severe enough to shorten the life of ordinary rollers but which ordinarily causes some corrosion of the roller, Dekoron presents a clean, uncontaminated surface to the material being conveyed. This eliminates the necessity for removing, cleaning, repainting, and replacing the rollers.

The rollers are made from steel tubing, over which is extruded a durable coating of plastic. Thickness and composition of the plastic armor can be varied to suit virtually any condition, though a semi-rigid vinyl coating approximately 1/32 in. in thickness is most often used.



Dekoron plastic coating by *Samuel Moore & Company*, on conveyor rollers increases roller life, and presents a clean, contamination-free surface to the material being conveyed.

For more data circle item code number on the postage free post card—p. 17

Heavy Duty Electrical Tape

D-2 MINNESOTA MINING & MANUFACTURING CO., St. Paul 6, Minn., announces a new heavy-duty plastic electrical tape designed for applications where more-than-average mechanical strength is needed.

Designated "Scotch" brand electrical tape No. 21, it is recommended by the manufacturer for anti-corrosion protection for pipes, cables and equipment laid underground where resistance to cuts and abrasion by rocks during back-fill is important.

It is also recommended for protecting and insulating cable and high tension leads subject to wear, abrasion and rough handling, and for bus bars carrying high voltage.

The tape has a black, vinyl plastic backing that is 20 mils thick. It has a dielectric strength of 22,500 volts, an insulation resistance of 200,000 megohms, and an electrolytic corrosion factor of 1.0.

The tape is available in 36-yard rolls ranging in widths from ¼-in. to 16-in.

Heavy duty *Scotch* tape offers protection from abrasion and rough handling.

Power Scarifier

D-3 G. H. TENNANT COMPANY, 2530 N. Second St., Minneapolis 11, Minn., has developed a new, heavy-duty floor scarifier that cleans large trucking aisles "on the run" and then dumps its load hydraulically.

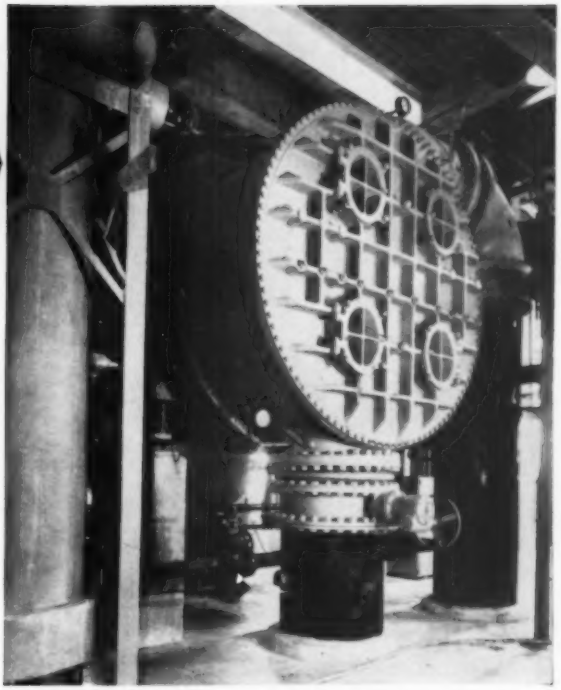
With this machine one man reportedly can shear off tough layers of grease, dirt and metal chips faster than a crew of 6 to 18 men. The scarifier travels 1 to 11 mph, and cleans a 36 in. path. Its capacity ranges from 20,000 to 60,000 sq ft per hour, depending on the thickness of grime.

High-speed cleaning action is provided by a scarifying cylinder, whirling at 1400 rpm. It has a smoothing, "planing" action which helps level humps and leaves aisles smooth, hard and dry for immediate trucking. No chemicals, water or detergents are needed.

Packed layers of dirt and grease are cut loose by a wire brush, containing twisted tufts of steel wire. Another accessory, called the Revo-tool, pulverizes extra-heavy soilage—like heavy chips, dried paint or varnish, tar and cement splashes. The Revo-tool cylinder contains hundreds of tool steel cutters, and it can also be used to score concrete for new topping.

Powered by a 25 hp, air-cooled engine, the scarifying cylinder hurls

Top Turbine Performance at Brazos River Plant Assured by CONSECO Condenser and Heater Unit



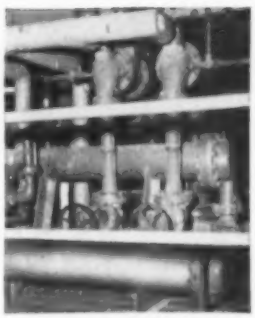
Heater Handles 123,000-lb. Feedwater Per Hour

Another example of the way Conseco Equipment helps step up central station performance is found at Brazos River, Texas, plant of Brazos River Power Transmission Electric Co-op.

Here a 14,000 sq. ft. 2 pass, non-divided flow Conseco Condenser, with horizontal type hot well and spring supports, handles a 11,500 kw. turbine.

As pictured in above photograph, a Conseco Feedwater Heater at left of condenser is a high pressure vertical unit handling 123,000 lb. of feedwater per hr., from 293 deg. to 362 deg. F at 800 psig extraction steam. Heater is fitted with cast-steel heads and is of the pull-through type.

Besides the high-pressure unit shown, this Conseco Feed Heating installation includes a low-pressure horizontal unit and an intermediate pressure vertical unit. Shown below at right, is the Conseco Air Injector installed at Brazos River. It is of the twin-element, two-stage type, with separate inter and after condensers.



Conseco Twin Element, Two-Stage Air Injector installed at Brazos River Plant, Texas

***CONSULT CONSECO ENGINEERS** about your condenser and feedwater heater needs. They will be glad to tell about the advanced features which assure trouble-free, low cost performance in your plant*

CONSECO LINE includes:

BOILERS • CONDENSERS • STEAM AIR JET EJECTORS • DEAERATORS • CLOSED HEATERS

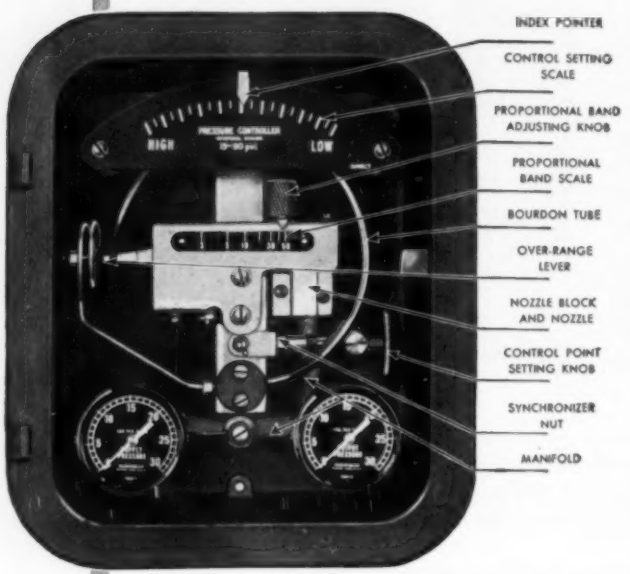
CONSECO

CONDENSER SERVICE & ENGINEERING CO.

HOBOKEN, NEW JERSEY

MASONEILAN MODEL 2700 PRESSURE CONTROLLER

Offers Accurate Proportional Control...
Precise Response...
Ease of Adjustment...



...YET IS MODERATELY PRICED

Masoneilan No. 2700 Pressure Controllers are especially designed for applications requiring accurate control when expensive instruments are not warranted. The pneumatic feedback, usually found only in more elaborate proportional controllers, assures precise response. The Control point setting mechanism provides accuracy of adjustment and easily read expanded index scale. Control action is reversible with either bourdon or bellows. The controllers are furnished in two case styles: a universal case for panel mounting; and a specially designed case for valve or wall surface mounting.

Applications include — pump governors, steam pressure reducing stations, gas well pressure reduction, and many others requiring small to intermediate proportional band.

MASONEILAN **MASON-NEILAN REGULATOR COMPANY**
1206 ADAMS STREET, BOSTON 24, MASSACHUSETTS, U. S. A.

Sales Offices or Distributors in the Following Cities: New York • Syracuse • Chicago St. Louis • Philadelphia • Houston • Denver • Pittsburgh • Cleveland • Cincinnati • Tulsa Atlanta • Los Angeles • San Francisco • Salt Lake City • El Paso • Boise • Albuquerque Detroit • Charlotte, N. C. Mason-Neilan Regulator Co., Ltd., Montreal and Toronto

new equipment (continued)

For more data circle item code number on the postage free post card—p. 17

Cleaning capacity of this *G. H. Tennant Company* power scarifier is from 20,000 to 60,000 sq ft/hr. "Bite" of brush into grime is controlled hydraulically.

loosened grime into a built-in hopper. At the same time a vacuum pulls lighter dirt and dust into a heavy fabric bag.

Hydraulic control of the hopper is a special feature. In 18 seconds, it is claimed, an operator can lift and dump average loads of 530 lb. He lifts the hopper to a 35 in. clearance, then dumps it directly into a tote or trash box, without extra handling. He also controls the "bite" of brush into grime hydraulically. By pushing a lever, he raises or lowers the brush to get the desired pressure and contact with floor surfaces.

A 4-speed transmission allows the operator to slow to 1 mph in busy aisles and speed up to 11 mph in open areas. A 4-cylinder, 25 hp Wisconsin engine propels the machine, which is driven through both rear wheels.

Non-Alkaline Cleaner

D-4 MAGNUS CHEMICAL COMPANY, Garwood, N. J., announces a new type of steam cleaning compound containing no alkaline salts, known as Magnus 72.

This new feature is important because it removes a hazard common to steam cleaning compounds containing alkaline materials—the conductivity of their solutions and their residues. When used for cleaning any equipment where electrical circuits were involved, the former types of cleaners were a frequent source of short-circuiting troubles.

Other advantages claimed for the new compound are its neutral reaction,

TOUGH LAYOUTS

- ✔ Assured Safety
- ✔ Efficient Operation
- ✔ Minimum Fuel Costs
- ✔ Low Maintenance
- ✔ Long, Trouble-Free Life

MADE SIMPLE BY NAVCO

The high degree of skill acquired by Navco Engineers from long experience in solving unusual Piping problems is your guarantee of an accurate and workmanlike Piping System.

Consult Navco for your next Piping Job

NAVCO

NAVCO PIPING

NATIONAL VALVE & MANUFACTURING COMPANY • PITTSBURGH, PA.

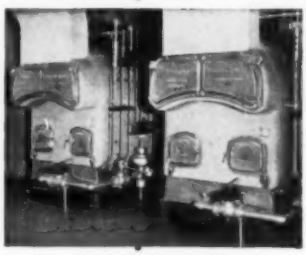
NEW YORK • CHICAGO • CLEVELAND • BOSTON • ATLANTA • TULSA • BUFFALO • CINCINNATI

Santa Rosa Hospital Built for Reliability . . .
and Selected

KEWANEE

HEAVY-DUTY BOILERS

SANTA ROSA HOSPITAL, San Antonio, Tex.
PHELPS, DEWEES & SIMMONS, Architects
GUARD M. BAKER, Engineer
JUD PLUMBING & HEATING CO., Heating Contractors



By specifying Kewanee Heavy-Duty Boilers, for 100, 125 or 150 pounds working pressure, large institutions can be certain of dependable heat at all times with an ample reserve for emergencies . . . *plus high pressure steam* for kitchens, laundries, sterilization and other equipment.

Pictured is the Santa Rosa Boiler Room with its battery of 2 Heavy-Duty Kewanees each of 270 HP . . . producing a total of 15,000 lbs. steam hourly.

FOR HEATING, POWER AND INDUSTRIAL PROCESS STEAM

Wherever steam is needed . . . *high or low* pressure . . . there is a Kewanee Boiler just right. Ask for complete catalogs and information.

KEWANEE BOILER CORPORATION
KEWANEE, ILLINOIS
Eastern District Office: 40 West 40th Street, New York City 18
Division of American Radiator & Standard Sanitary Corporation

Heating America's Finest Buildings

KEWANEE BOILERS

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · ACME CABINETS · CHURCH SEATS · DETROIT · ARKLATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

new equipment (continued)

For more data circle item code number on the postage free post card—p. 17

and the fact that it cannot clog steam cleaning equipment. It will not dull or streak any good paint, is non-corrosive, does not generate objectionable fumes, and can be used indoors.

The product is a liquid concentrate, which saves time and labor required to mix powdered or granular cleaners. Two to three quarts of the concentrate are poured into the tank of the steam cleaning machine and the tank filled with water. Where solution tank is separate, mix 2-3 quarts of Magnus 72 with 50 gallons of water.

The manufacturer recommends it for cleaning factory production machines, paper mill equipment, food machinery, and other oily or greasy metal parts.

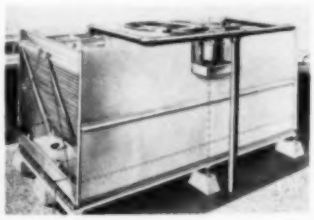
Water Cooling Tower

D-5 THE MARLEY COMPANY, INC., 222 W. Gregory Blvd., Kansas City, Mo., has introduced a new Double-Flow Aquatower, a water cooling tower for use wherever intermediate capacities of cold water are required.

Cooling towers in this range are widely used in the power, petroleum, gas, chemical processing, food processing, and metalworking industries, and wherever air conditioning and refrigeration are used.

Outstanding features of the new tower are: its height is only 7½ ft for the 150-ton unit; pumping head and required fan hp are extremely low for any given capacity and design performance; it is the first water cooling tower in the medium-capacity range to use the patented Double-Flow principle—one fan utilizing air from two completely open sides; tower weight is evenly distributed over a wider area than that of other cooling towers of similar capacity; design simplifies maintenance inspection.

The new Marley Double-Flow Aquatower comes in seven standard sizes, starting with a 50-ton unit. It is available in all steel or wood with asbestos cement board casing.



NEW BULLETIN

Describes Newest BIG Fairbanks-Morse Diesel Dual Fuel Engine!

Send for Your Copy!

Here is complete, up-to-date and authoritative information on the newest Diesel Dual Fuel engines in the 3500 hp. class! A valuable reference, it covers the advanced design features you'll find in the new Fairbanks-Morse Model 31A18 Oil Diesel and Dual Fuel engines. With cross-sections and descriptive diagrams, it covers in detail the design and operation of these heavy duty engines, including complete descriptions of Dual Fuel operations—showing how the Model 31A18 Oil Diesel engine may be economically changed to a Dual Fuel engine by merely installing simple accessory equipment. Power station owners and operators interested in low operating and maintenance cost, automatic safety control, simplicity of design and operation—and complete dependability with high efficiency—should have this book for their files. Use the coupon to get your copy.

FAIRBANKS-MORSE,

a name worth remembering

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • ELECTRICAL MACHINERY • PUMPS • SCALES • RAIL CARS • MAGNETOS • FARM MACHINERY

TO LEARN MORE ABOUT THESE MODEL 31A18 FEATURES...

En bloc construction ... for greater rigidity and correct alignment ...

Removable cylinder liners ... with integrally cast leakproof waterjacket ...

Dome-shaped cylinder heads ... for improved combustion and cooling ...

Improved connecting rod design ... pistons and rods may be removed without disturbing crankpin bearings ...

Oil-cooled pistons ... for longer piston ring and liner life ...

Simple controls ... start or stop by the movement of a single lever. Hydraulic governor speed control ...

Use this Coupon!

Fairbanks, Morse & Co.,
600 South Michigan Ave.,
Chicago 5, Illinois

Send me a copy of the new bulletin on the Model 31A18 Oil Diesel and Dual Fuel engine.

Name_____

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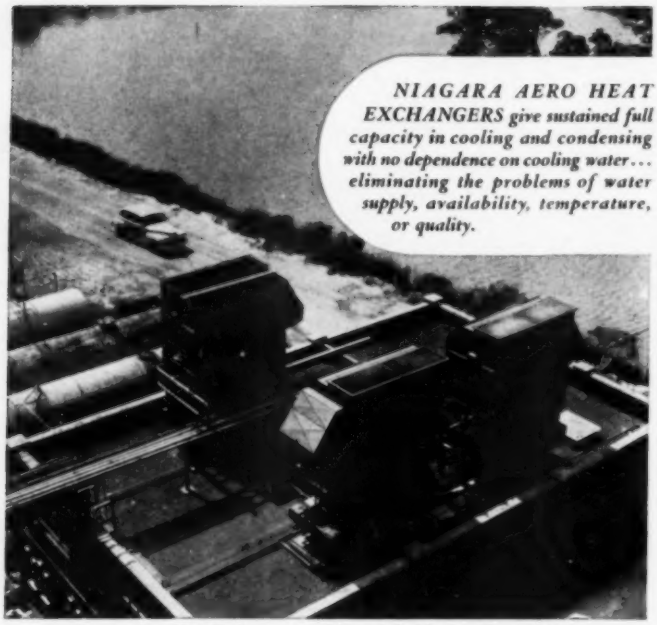
★


NIAGARA AERO HEAT EXCHANGERS give sustained full capacity in cooling and condensing with no dependence on cooling water... eliminating the problems of water supply, availability, temperature, or quality.

Niagara Aero Heat Exchangers at a Plant of the Heyden Chemical Corp.

Still Operations Improved by a New Cooling Method

• NIAGARA AERO HEAT EXCHANGERS cool the reflux supply or condense vapors at a vacuum by controlled evaporation of water directly on the heat exchange surfaces.

Liquid or vapor temperatures are always held constant by the Niagara "Balanced Wet Bulb" control method, which automatically varies the cooling effect proportionately to the load. The distillation is therefore uniform throughout all changes in climatic conditions the year around; it is the same in the heat of summer as in the freezing cold of winter. Continuous maximum production is thus insured.

Non-condensibles are effectively separated at the condensate outlet, with notable sub-cooling after separation for greater vacuum pump efficiency.

Use of Niagara Aero Heat Exchangers reduces your operating costs and removes many sources of your troubles in distillation column operation. Ask for new bulletin #120.

NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

Dept. SP, 405 Lexington Ave. **New York 17, N. Y.**

Experienced District Engineers in all Principal Cities of U. S. and Canada

new equipment (continued)

For more data circle item code number on the postage free post card—p. 17

Acoustical Baffles

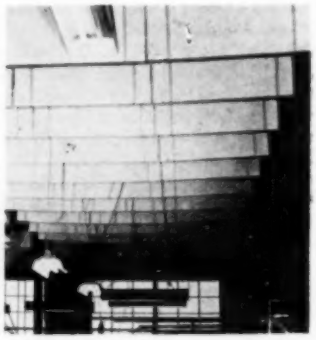
D-6 OWENS-CORNING FIBERGLAS CORP., Toledo 1, Ohio, has developed Fiberglas Noise-Stop Acoustical Baffles, designed to reduce the loudness of factory and shop noises.

Easily and economically installed, the new product consists of a rigid panel of Fiberglas PF (Preformed) insulation, measuring 24 by 48 in., 1½ in. thick, completely enclosed in a printed plastic film.

Although designed chiefly for use in reducing the intensity of disturbing noises in such high noise level areas as factories and machine shops, the baffles also may be used in other rooms requiring noise reduction.

The baffles are adaptable for use in areas where the cost of installing standard types of acoustical ceilings would be prohibitive because of ceiling obstructions often found in plants and shops, such as chain hoists, steam lines, heating ducts, large lighting fixtures, sprinkler systems and skylights.

The baffles are hung from wires strung horizontally at the desired height. Installation generally is made by stringing wire at predetermined spacings to run the length of the room. The weight and gauge of the wire used depends upon the span. Use of turnbuckles is recommended in attaching wires, thus eliminating sag in the wire when the baffles are hung. Pressure-sensitive tape secures a short

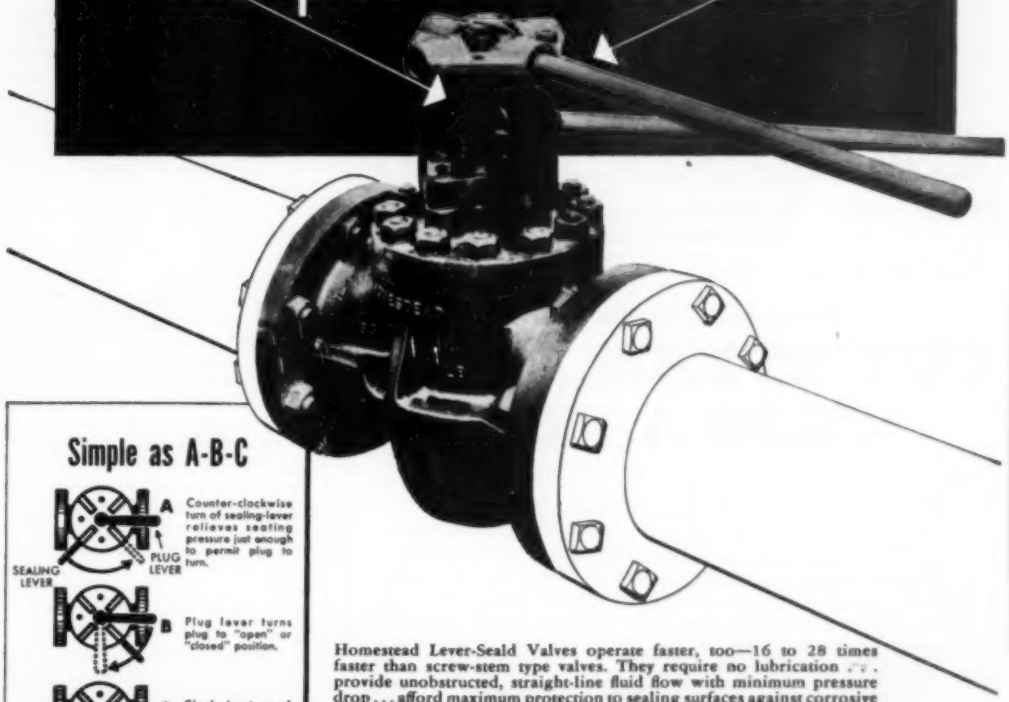


Fiberglas noise-stop acoustical baffles, designed to reduce loudness of factory and shop noises, have been developed by *Owens-Corning Fiberglas Corporation*. Application: in areas where cost of installing standard types of acoustical ceilings would be prohibitive because of ceiling obstructions.

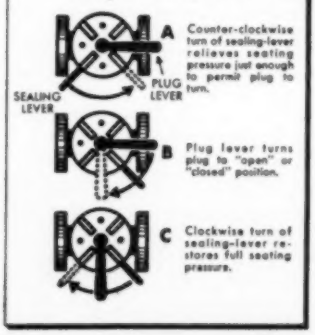
- **at all times**
- **under all conditions**
- **throughout its long lifetime of service**

This Homestead Valve will always work

it's **stickproof** because it's **lever-seald**



Simple as A-B-C


A
Counter-clockwise turn of sealing-lever relieves seating pressure just enough to permit plug to turn.
SEALING LEVER
PLUG LEVER
B
Plug lever turns plug to "open" or "closed" position.
C
Clockwise turn of sealing-lever restores full seating pressure.

Homestead Lever-Seald Valves operate faster, too—16 to 28 times faster than screw-stem type valves. They require no lubrication . . . provide unobstructed, straight-line fluid flow with minimum pressure drop . . . afford maximum protection to sealing surfaces against corrosive and erosive line fluids. And because only a quarter-turn is needed for full opening or closing, they are ideal for installation in restricted areas where operation of other types of valves might be difficult.

Next time you have damaged or sticking valves, replace them with Homestead Lever-Seald Plug Valves. Once you use them you'll never be satisfied with ordinary valves.

For complete information write for Valve Reference Book No. 39-3.

HOMESTEAD LEVER-SEALD PLUG VALVES

HOMESTEAD VALVE MANUFACTURING COMPANY

Serving since 1892

P.O. BOX 70 CORAOPOLIS, PA.

TUBES FOR BENT AND STRAIGHT TUBE BOILERS

COIL AND SPECIALTY BENDING

IDEAL FLUE TOOLS

STEEL AND COPPER FERRULES

C

BOILER TUBE CO. OF AMERICA

McKEES ROCKS, PA. (Pittsburgh District)

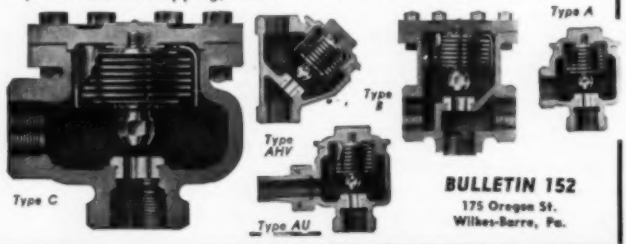
PITTSBURGH CHICAGO

FRED S. RENAULD & CO., LOS ANGELES

Nicholson Traps Help

CUT STEAM COST $500,000 A YEAR

At one of the nation's large processing plants a campaign to promote economical steam use by improving heat transfer efficiency has resulted in a yearly saving of $500,000. Credit for a fair portion of this is given to improved steam trapping, which resulted from the installation of Nicholson thermostatic traps. To see why an increasing number of leading plants are standardizing on Nicholsons for positive drainage and faster heat transfer, send for Bulletin 152.



BULLETIN 152
175 Oregon St.
Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

new equipment (continued)

For more data circle item code number on the postage free post card—p. 17

length of tying wire to an edge of each baffle. The tape is lapped over the wire to give strength of two thicknesses. The end of the tape is stapled to itself to prevent slipping. Then the baffle is hung, with the tying wire looped and twisted around the overhead wire. The baffles may be hung above or below the ceiling lights and in one or more tiers.

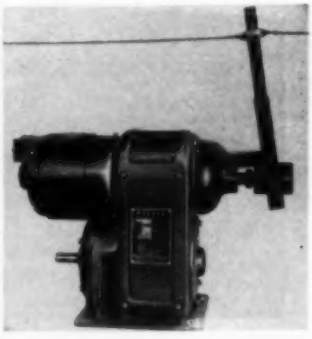
These baffles utilize the plastic film covering and interior board of fibrous glass. The film covering, which completely envelops the board, acts as a drumhead, transmitting sound by vibration into the Fiberglas board. This board reduces noise because of its ability to trap sound waves in millions of tiny cells formed by the intertwining of fine fibers of glass. The baffles are light-weight, non-combustible, and easily maintained.

Variable Speed Drives

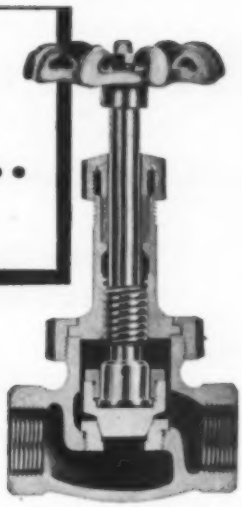
D-7 REEVES PULLEY COMPANY, Columbus, Indiana, has announced the availability of mechanical automatic control on its Series 1000 Fractional HP Vari-Speed Motodrives.

The drives are manufactured in ¼, ½, ¾, and ¾ hp sizes, with speed variations as high as 10 to 1. Each consists of the speed-varying mechanism and the user's choice of any standard motor, with a built-in helical gear speed reducer optional.

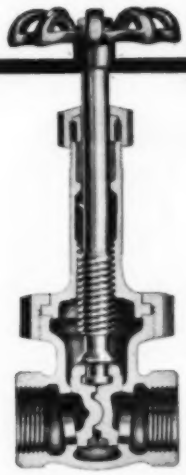
The Motodrive is one of three basic units designed to meet every variable speed control need. Other units are the Variable Speed Transmission, in capacities up to 87 hp and speed variation as high as 16 to 1; and the Vari-Speed Motor Pulley, available in capacities up to 10 hp and speed variations up to 4 to 1.



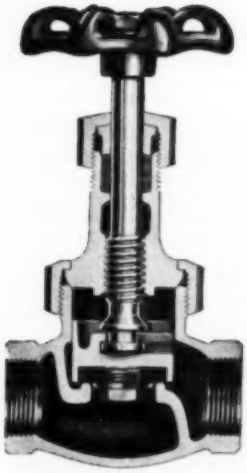
Walworth bronze valves...



Walworth No. 225P Globe Valve
500 Brinell Seat and Disc



Walworth
No. 29 Gate Valve



Walworth No. 95 Globe Valve
Re-New-Disc

built to give dependable trouble-free service on all recommended jobs

Walworth No. 95 Bronze Globe Valves (Angle Type: No. 96) are recommended for service where throttling is not required. They are rated at 150 psi working steam pressure, 500F; 300 psi cold water, oil or gas. The improved renewable disc and lock-on, slip-off disc holder — an original Walworth development—saves time and trouble. This valve can be repacked under pressure when fully opened. All parts are designed to give maximum service and strength.

Walworth No. 29 Bronze Gate Valves are rated at 200 psi working steam pressure, 550F; 400 psi cold water, oil and gas. These valves have rising stems and integral seats. Sizes 2-inch and smaller have union bonnets; sizes 2½ and 3-inch have bolted bonnets. Valves up to and including ¾-inch have solid wedge discs; 1-inch and larger have split wedge discs. These valves can be repacked under pressure when fully opened.

Walworth No. 225P Bronze Globe Valves (Angle Type: No. 227P) are rated at 350 psi working steam pressure, 550F; and 1000 psi non-shock service on cold water, oil and gas. The stainless steel, plug type seat and disc — heat treated to 500 Brinell — can be closed on sand, slag, scale and similar floatage, without injury to the seating surfaces. They are the longest wearing, TOUGHEST bronze valves you can buy.

For full information about Walworth Quality Bronze Valves, see your Walworth distributor, or write:

WALWORTH
valves and fittings
60 EAST 42nd STREET NEW YORK 17, N. Y.

NEWS for the South and Southwest

WHAT'S A SILICONE?

Silicone Exposition to Visit Southwest

Wichita, Kansas (April 9-11th); Fort Worth, Texas (April 15-17th); and Houston, Texas (April 22-24th)

Dow Corning Corporation's *What's a Silicone* exhibit was originally designed to illustrate the advantages of silicones to government and military personnel in Washington, D. C. It was so well received that corporation officials immediately rerouted it on a tour of the major industrial centers of the country. It was shown at the recent Plant Maintenance Conference in Philadelphia and will visit the Southwest in April. Southern District Managers of Dow Corning Corporation are *M. H. Leavenworth* in Dallas, Texas, and *R. B. Ehlers* in Atlanta, Georgia.

WHAT'S a silicone? To answer that question, Dow Corning Corporation has gathered over ten tons of equipment, including working demonstrations, component parts, sections, cut-aways, samples and finished products, into the largest and most comprehensive display of silicones ever assembled. Known as the Dow Corning Silicone Exposition, the display is scheduled to be shown in April to executive, engineering and technical personnel in Wichita, Fort Worth and Houston.

Schedule

The exhibition will appear in the North Ballroom of the Hotel Broadview in Wichita, Kansas, on April 9th through the 11th; in the Crystal Ballroom of the Hotel Texas in Fort Worth on April 15th through the 17th; and in Studios A and B of the Shamrock in Houston on April 22nd through the 24th.

The exposition is designed to demonstrate the properties that distinguish silicones from other engineering materials. These properties, of course, are unique and somewhat difficult to describe. For example, Silastic, the Dow Corning silicone rubber, is the same at —100 F as it is at 500 F. Other silicone products have much the same order of heat stability, although all of them look like quite conventional materials.

To demonstrate this fact, bellows of Silastic are subjected to continuous flexing in baths of hot oil and of dry ice. Samples of silicone varnished glass cloth are placed on a hot plate held at 450 F. Silicone grease is compared to organic grease in paired bearings set in blocks held at 300 F and at —75 F.

Other silicone characteristics are also demonstrated. The relative arc resistance of silicone rubber, silicone-glass laminate, and conventional organic laminate is shown by subject-

ing them to a 15,000 volt arc. The moisture resistance of silicone (Class H) electrical insulation is shown by two motors with cut-away frames. One operates in the range of 530 F, reversing every 7 seconds, while a constant stream of water plays on its windings. The other is "dunked" completely in water several times a minute. Streams of water on silicone-treated and untreated concrete samples show the effectiveness of the new silicone-based water repellent treatments for masonry.

The usefulness of these properties is confirmed by hundreds of actual sample products, ranging from huge railroad generators to printed circuits for sub-miniature electronic devices. They include submarine and aircraft motors, jet aircraft deicing flaps, oil seals, O-rings, space heaters, life jackets, rubber, plastic and metal moldings.

Tube Turns—Tulsa Distr. Mgr.

TUBE TURNS, INC., LOUISVILLE, KY., has announced the appointment of LINCOLN D. HALL as district manager in charge of the Mid-Continent territory, with headquarters in the Wright Building, TULSA. He succeeds ROBERT S. TYLER, JR., who has resigned to join the newly established TYLER - DAWSON SUPPLY COMPANY, Tulsa.

FUTURE EVENTS
Of Engineering Interest

SOUTHERN SAFETY CONFERENCE AND EXPOSITION, B. B. Carr, Exec. Dir., 2120 First Ave., N., Birmingham 3, Ala.
Mar. 2-4, Biltmore Hotel, Atlanta, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS, C. L. Warwick, Exec. Sec'y, 1916 Race St., Philadelphia 3, Pa.
Mar. 3-7, Spring Meeting and Committee Week, Cleveland, Ohio.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS, A. B. Campbell, Exec. Sec'y, 919 Milam Bldg., Houston 2, Texas
Mar. 10-14, Buccaneer Hotel, Galveston, Texas

THE SOCIETY OF THE PLASTICS INDUSTRY, INC., Wm. T. Cruse, Exec. V.P., 295 Madison Ave., New York 17, N. Y.
Mar. 11-14, Fifth National Plastics Exposition, Exposition Hall, Philadelphia, Pa.

SOUTHEASTERN ELECTRIC EXCHANGE, J. W. Talley, Mgng. Dir., 303 Haas-Howell Bldg., Atlanta, Ga.
Mar. 13-14, Engineering and Operation Section, Jung Hotel, New Orleans, La.
Apr. 21-22, General Conference, Boca Raton Hotel and Club, Boca Raton, Fla.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Dr. Herschel H. Cudd, Georgia Institute of Technology Experimental Station, 225 North Ave., N.W., Atlanta, Ga.
Mar. 16-19, Atlanta Meeting, Biltmore Hotel, Atlanta, Ga.

AMERICAN SOCIETY OF TOOL ENGINEERS, Harry E. Conrad, Exec. Sec'y, 10700 Puritan Ave., Detroit 21, Mich.
Mar. 17-21, Industrial Exposition, Chicago, Ill.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, C. E. Davies, Sec'y, 29 West 39th St., New York, N. Y.
Mar. 24-26, Spring Meeting, Seattle, Wash.

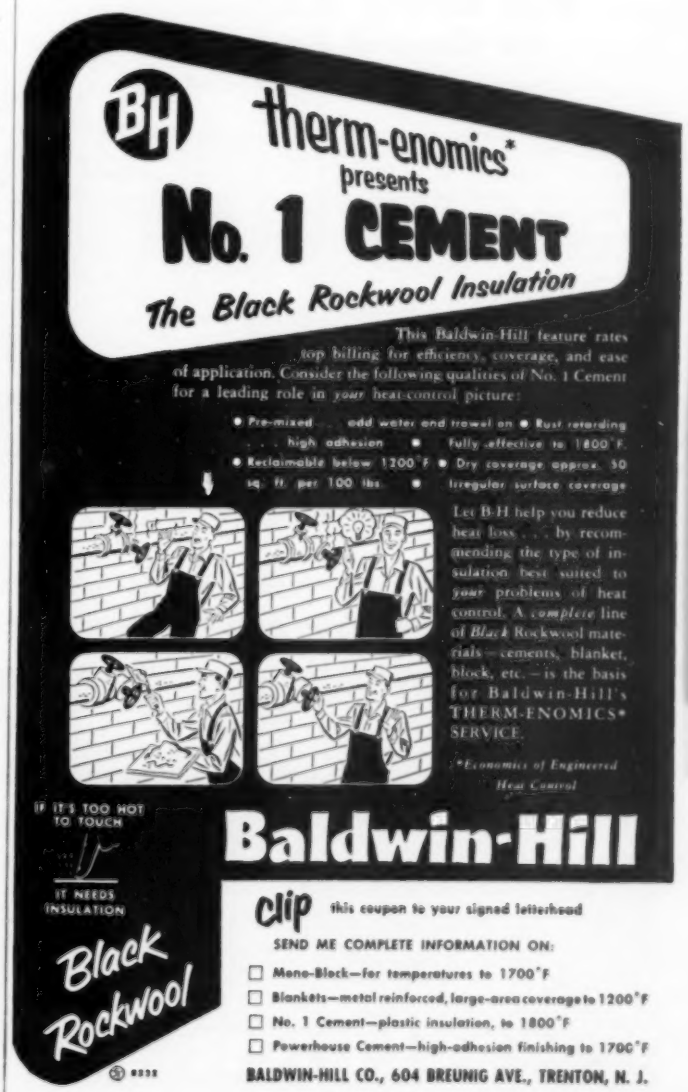
AMERICAN POWER CONFERENCE, R. A. Buidenholzer, Dir., Dept. of Mech. Engrng., Illinois Institute of Technology, Chicago, Ill.
Mar. 26-28, Sherman Hotel, Chicago, Ill.

ILLUMINATING ENGINEERING SOCIETY, A. Dexter Hinckley, Exec. Sec'y, 51 Madison Ave., New York 10, N. Y.
Apr. 6-8, Southwestern Regional Conference, Hotel Tulsa, Tulsa, Okla.
Apr. 20-22, Southern Regional Conference, Hermitage Hotel, Nashville, Tenn.

AMERICAN SOCIETY OF LUBRICATION ENGINEERS, W. F. Leonard, Sec'y, 343 S. Dearborn St., Chicago 4, Ill.
Apr. 7-9, Statler Hotel, Cleveland, Ohio

SILICONE EXPOSITION, M. H. Leavenworth, Dist. Mgr., Dow Corning Corp., 2722 Taylor St., Dallas, Texas
Apr. 9-11, Hotel Broadview, Wichita, Kans.
Apr. 15-17, Hotel Texas, Fort Worth, Texas
Apr. 22-24, Shamrock Hotel, Houston, Texas

NATURAL GASOLINE ASSOCIATION OF AMERICA, Wm. F. Lowe, Sec'y, 422 Kennedy Bldg., Tulsa 3, Okla.
Apr. 30-May 2, Annual Convention, Rice Hotel, Houston, Texas


BH
therm-enomics*
presents
No. 1 CEMENT
The Black Rockwool Insulation
This Baldwin-Hill feature rates top billing for efficiency, coverage, and ease of application. Consider the following qualities of No. 1 Cement for a leading role in your heat-control picture:
• Pre-mixed . . . add water and trowel on • Rust retarding . . . high adhesion • Fully effective to 1800°F.
• Reclaimable below 1200°F • Dry coverage approx. 50 sq. ft. per 100 lbs. • Irregular surface coverage
Let B-H help you reduce heat loss . . . by recommending the type of insulation best suited to your problems of heat control. A complete line of Black Rockwool materials—cements, blanket, block, etc.—is the basis for Baldwin-Hill's THERM-ENOMICS* SERVICE.
*Economics of Engineered Heat Control
IF IT'S TOO HOT TO TOUCH
IT NEEDS INSULATION
Black Rockwool
Baldwin-Hill
clip this coupon to your signed letterhead
SEND ME COMPLETE INFORMATION ON:
☐ Mono-Block—for temperatures to 1700°F
☐ Blankets—metal reinforced, large-area coverage to 1200°F
☐ No. 1 Cement—plastic insulation, to 1800°F
☐ Powerhouse Cement—high-adhesion finishing to 1700°F
BALDWIN-HILL CO., 604 BREUNIG AVE., TRENTON, N. J.

New headquarters building for General Electric Company's Southeastern Apparatus Sales District, Peachtree Road at 28th St., Atlanta, Georgia.

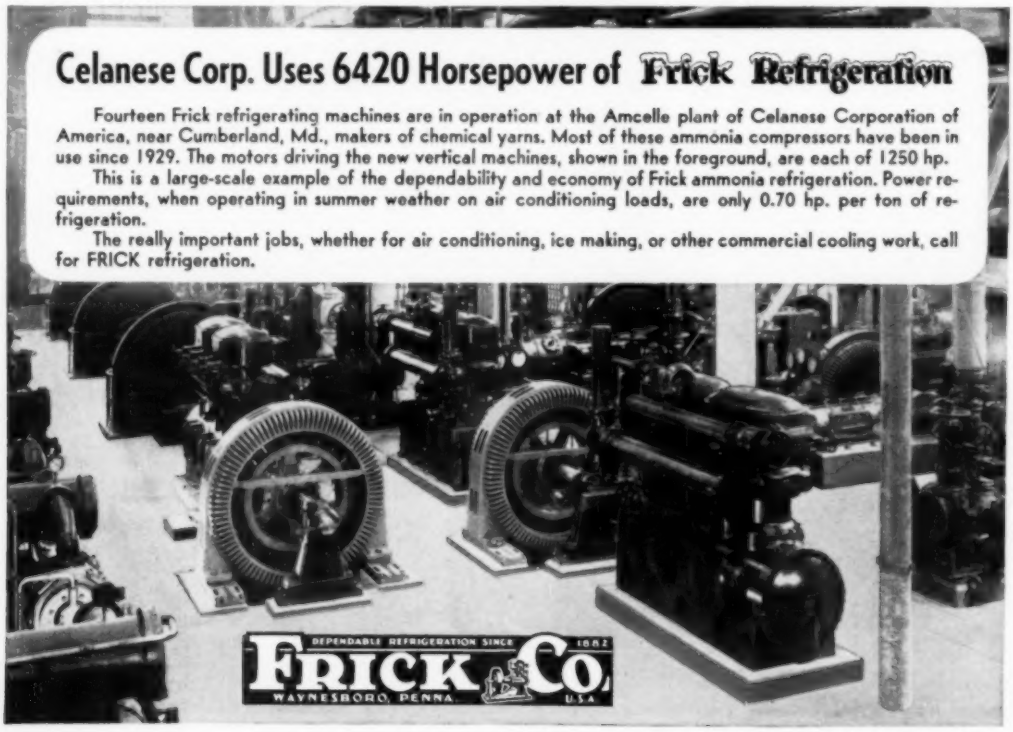
New District Headquarters for General Electric Co.

Peachtree Road at 28th St.—Atlanta

THE NEW headquarters office for GENERAL ELECTRIC COMPANY'S Southeastern Apparatus Sales District was recently viewed at a planned Open House ceremony. G.E. customers, business, civic, and industrial leaders were among more than 2200 invited guests, as well as General Electric officials from the Company's headquarters offices.

General Electric has been an active Atlanta organization since its forerunner, the Thompson-Huston Company, opened a Southern office in 1888; its name was changed, on the Atlanta books, when the General Electric Company was formed in 1892. The neophyte staff, engaged in the sale of electric generating and utilization equipment, consisted of one man and a secretary, and sold everything made by GE at the time. Now, in keeping with the growth of its service to the South, GE's Apparatus Group alone employs nearly 400 Atlanta citizens.

According to CARTER L. REDD, district manager for the Apparatus Field Sales Department, the expanded facilities for improved customer service throughout the district include marketing departments for industrial electric equipment, transportation equipment, and power generating, distribution, and other supplies for electric utilities. Other district service departments include


Celanese Corp. Uses 6420 Horsepower of Frick Refrigeration
Fourteen Frick refrigerating machines are in operation at the Amcelle plant of Celanese Corporation of America, near Cumberland, Md., makers of chemical yarns. Most of these ammonia compressors have been in use since 1929. The motors driving the new vertical machines, shown in the foreground, are each of 1250 hp.
This is a large-scale example of the dependability and economy of Frick ammonia refrigeration. Power requirements, when operating in summer weather on air conditioning loads, are only 0.70 hp. per ton of refrigeration.
The really important jobs, whether for air conditioning, ice making, or other commercial cooling work, call for FRICK refrigeration.
DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO, PENNA. U.S.A.

How Can America Produce All the Steel It Needs . . . for Military . . . and Civilian Purposes?

FREE BOOKLET Tells How to Conduct Scrap Salvage Program in *Your* Business.

Address Advertising Council, 25 W. 45th St., New York 19, N. Y.

One way is to feed more pig iron into the furnaces. But . . .

That will require *more* supplies of ore, limestone, coal, etc.*—to say nothing of more new ore boats and rail cars to transport the additional supplies.

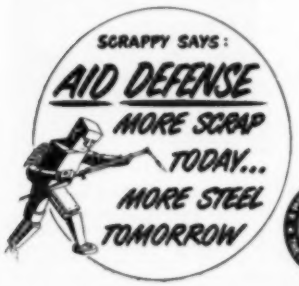
A better way—the *only* practical way—is to use the *dormant* iron and steel scrap lying around in the form of old machines, equipment, tools and metal structures.

Your business *must* have available scrap—in *some* form. That scrap is *needed* to keep the furnaces going in the steel mills . . . to keep our fighting forces and our allies well armed . . . to sustain our civilian life at home.

Think how many ways *you* use iron and steel. Think what would happen if it became extremely scarce. Put your iron and steel scrap to good use—now—by selling it to your local scrap dealer.

Don't delay—the emergency is becoming more severe every day.

*For every ton of scrap fed into the furnaces, we save approximately 2 tons of iron ore, 1 ton of coal, nearly ½ ton of limestone and many other critical materials. Also, scrap helps make steel faster, shortens the refining process.

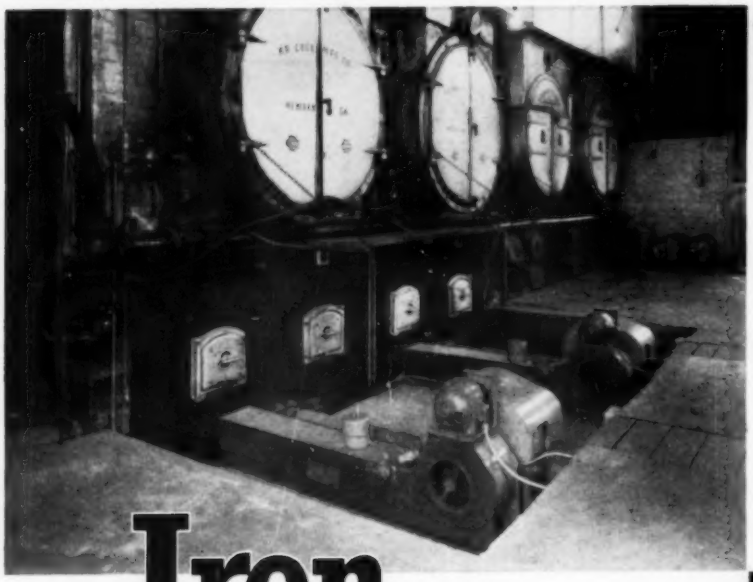


NON-FERROUS SCRAP IS NEEDED, TOO!

This advertisement is a contribution, in the national interest, by

SOUTHERN POWER & INDUSTRY

"Iron Fireman saves over $5,800 a year at Reeves Brothers' Chesnee (S.C.) Mill"



says William C. Ariail, Jr.
Supt. of the Plant

"Firing automatically adjusted to the load gives us peak steam production when needed and eliminates excess firing during low demand," says Mr. Ariail. "Fuel costs dropped from $13,416 to $10,400 a year. Total savings, including labor are $5,805."

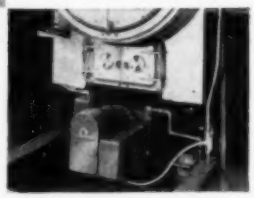
Two Iron Fireman underfeed Coal-Flow stokers in Reeves Brothers textile mill, Chesnee, S. C. Coal is fed directly from main bunkers without manual handling. Steam is used for both heating and processing.

Iron Fireman

The stoker with the modulated fire and built-in coal conveyor

Coal flows automatically from the bunker to the fire, without the cost of manual handling or use of expensive auxilary conveyors. Equally important, its flow is scientifically regulated to provide the exact amount of heat required to maintain the boiler pressures or temperature you require. At the same time the rate of air supply is constantly adjusted to the coal feeding rate.

Important savings are the result of combining this efficient firing with automatic fuel handling. You cannot afford to decide on new firing equipment without considering Iron Fireman.



Iron Fireman Rotary Oil Burner
Fires low-cost, heat-rich heavy oils (No. 5 and No. 6) with complete dependability, regardless of viscosity changes. A real money saver. Capacities up to 500 boiler horsepower.

Iron Fireman Commercial Gas Burner
Vertical type is illustrated above. Others include Radiant Inshot and Ring types. Flexible operation, easy to install. Capacities to 500 boiler horsepower.

MAIL COUPON FOR FULL INFORMATION

IRON FIREMAN MANUFACTURING CO., 3252 W. 106th St., Cleveland 11, Ohio.

Please send literature as checked:

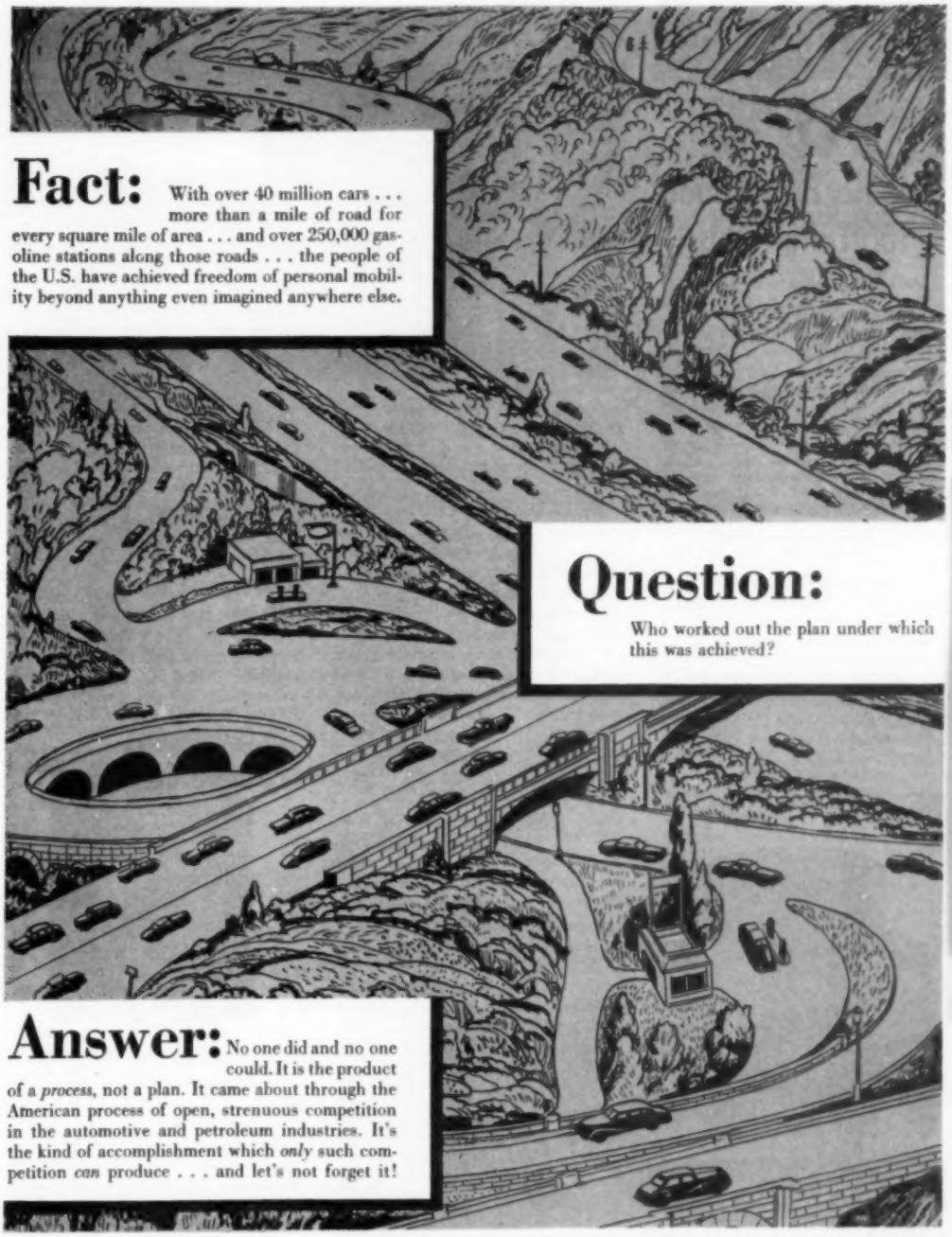
- ☐ Coal-Flow Stoker
- ☐ Rotary Oil Burner
- ☐ Commercial Gas Burner

Name_____

Address_____

City_____

State_____



Fact: With over 40 million cars . . . more than a mile of road for every square mile of area . . . and over 250,000 gasoline stations along those roads . . . the people of the U.S. have achieved freedom of personal mobility beyond anything even imagined anywhere else.

Question:

Who worked out the plan under which this was achieved?

Answer: No one did and no one could. It is the product of a *process*, not a plan. It came about through the American process of open, strenuous competition in the automotive and petroleum industries. It's the kind of accomplishment which *only* such competition *can* produce . . . and let's not forget it!

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The competitive system delivers the most to the greatest number of people

JEFFERSON

300 LB.
Trouble Free Unions
for Tough Jobs

JEFFERSON Unions are made of Air Furnace Malleable Iron of an average tensile strength of 55,000 p.s.i., with a yield point of 36,000 pounds and an elongation of 15% in two inches.

Our seat rings are cut from seamless drawn brass tubing, free from all casting defects—sound and uniform always.

They are accurately tapped at all times; are carefully air tested and inspected before shipment, and each and every one approved only if they meet our rigid standards of inspection.

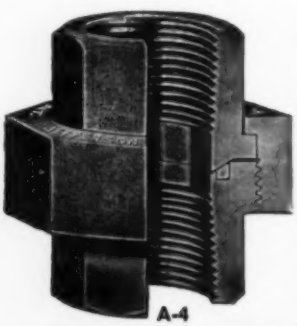
Slightly Higher Priced
But more than worth it.

See these outstanding features—

- A ground ball joint to give leak-proof service
- Octagonal with square corners fits any type of wrench
- No gasket required, hence no maintenance problem
- Hot-dip galvanized to Government Standard for corrosion resistance

Made in all thread sizes from ¼" to 4" American Standard Taper Threads.

Also manufacture Excel 250 lbs and Master 150 lbs. All unions can be furnished with all-iron seats.



A-4

JEFFERSON
UNION CO.
650 WEST 26th St., NEW YORK 1.
79 GOODING ST., LOCKPORT, N.Y.
45 FLETCHER Ave., LEXINGTON, MASS.

A. W. Pledger, of Western Union, briefing *R. W. Donald*, G. E. District Auditor and *C. L. Redd*, G. E. District Manager, on the new control board as the first messages came through. This new switching center brings the many Southeast offices into direct contact with all G. E. factories and headquarters.

agent and distributor sales, installation and service engineering, advertising and sales promotion, accounting, and order service.

Mr. Redd also explained that headquarters for Georgia sales are located in the new building and that other sales offices are maintained in Augusta and Savannah.

Opening of the new Southeastern headquarters marks another step in the industrial expansion of the South, and gives concrete evidence of what may be expected in the South's industrial future.

In the past two years, the General Electric Apparatus Field Sales Group also has opened two new Service Shops, one in Atlanta and one in Charlotte, N. C. These two shops provide expanded repair and maintenance facilities for electrical apparatus in existing industries as well as the many new industries continually coming into the Southeast.

In the new district headquarters building in Atlanta, is one of the largest telegraphic centers in the country. All messages are re-transmitted without retyping. Therefore, distance between points is virtually of no consequence in determining delivery speed.

At the originating point, each message is typed on the typewriter-like keyboard of a teleprinter. As it is typed it arrives instantaneously at a switching center. An attendant notes the destination on a perforated tape, presses a button and an electric brain flashes the message to its destination.

The Company's first Atlanta office was a single room in the Kimball House. With the opening of the new offices on Peachtree Road at 28th Street, this Apparatus group now has three large buildings in Atlanta. The others are a three-story warehouse on Glenn Street, and the Atlanta Apparatus Service Shop on Peachtree Industrial Boulevard, opened in 1950.

J. K. Stafford Joins Atlantic Steel Company

J. K. STAFFORD, electric furnace authority, has joined Atlantic Steel Company, Atlanta, Georgia, it was announced recently by ROBERT S. LYNCH, company president.

J. K. Stafford, electric furnace authority, joins Atlantic Steel Co.

Mr. Stafford resigned from the Republic Steel Corporation after 35 years to accept his new position. Considered one of the nation's best informed experts on the production of steel in electric furnaces, Mr. Stafford is credited with helping to pioneer this method of steel-making.

Atlantic Steel Company's new 60-ton electric furnace is expected to be completed early this Spring.

Swan Now Asst. Mgr. of Dowell—Tulsa, Okla.

LESTER B. SWAN, General Manager of United Oilwell Service, S. A., in Caracas, Venezuela, has been named Assistant Manager of DOWELL INCORPORATED in TULSA.

Lester B. Swan, Asst. Mgr. Dowell Inc., Tulsa.

TROMER SMITH, former Eastern Division Manager of United, has been named General Manager of the South American company. United Oilwell Service is an associate company of Dowell. Smith is a former Dowell engineer, located in Great Bend, Kans. BASIL HODGES, formerly with Dowell in El Reno, Okla., will be Eastern Division Manager, replacing Smith.

Before his appointment as General Manager of United early in 1949, Swan was District Manager of Dowell in New Orleans. Previous to that he had served in Tulsa as a Development Engineer.

Garlock Export

The export operations of THE GARLOCK PACKING COMPANY, manufacturer of mechanical packings, have been consolidated and the New York office has been made headquarters of this division. The division, with R. S. PARKER, manager, is located at 30 Church Street, New York City.

Fairbanks, Morse & Co.—Scale & Electrical Divisions

FAIRBANKS, MORSE & Co., Chicago, has announced an autonomous operation for two of the company's divisions—Scale and Electrical.

The Scale Division will be headed by GEORGE C. WORTHLEY who has been with the company since 1914 and who has now been promoted from Sales Manager to General Manager of this division. JOE S. PETERSON succeeds Mr. Worthley as Sales Manager of the Scale Division.

GORDON R. ANDERSON, who has for a number of years been Works Manager of the company's Freeport, Illinois, plant where electrical products are manufactured, has been promoted to the position of General Manager of the Electrical Division of the company. W. H. KINGSLEY is Sales Manager of the company's Electrical Division. Both Mr. Anderson and Mr. Kingsley have their headquarters at the Freeport plant of the company.

Stewart Joins Woodward Iron

ERNEST L. STEWART, formerly Works Manager at MISSISSIPPI CHEMICAL CORP., YAZOO CITY, MISS., is now Assistant to the Superintendent, By-Products Division, WOODWARD IRON CO., WOODWARD, ALABAMA.

Mr. Stewart was previously Assistant Manager and Plant Engineer for Robbins Tire & Rubber Co. at Tuscumbia, and was Associate Engineer with TVA at Wilson Dam during construction of the Ammonia Plant. He is a member of A.S.M.E.

Ernest L. Stewart, now Assistant to the Superintendent, By-Products Div., Woodward Iron Co.

Two Units of Albright, West Virginia Station Scheduled for '52 Operation

WORK is progressing "on schedule" at the $38,000,000 power station being built at Albright, West Virginia, by two utilities in the West Penn Electric System—The Potomac Edison and Monongahela Power companies.

The new steam station will be jointly built and operated by PE and Monongahela, which are "sister" companies. Potomac Edison will own one 75,000 kilowatt unit; Monongahela will own one 75,000 kilowatt unit and a 135,000 kilowatt unit.

Power from the big new station will be sent via 132,000 volt transmission lines to major distribution points in Pennsylvania, West Virginia and Maryland. From these centers it will be relayed to customers in Pennsylvania, West Virginia, Virginia and Maryland.

Albright's new station was started in March of '51, with Sanderson and Porter supervising construction. Two units are scheduled to go on the lines late in 1952 if materials are available.

Originally it had been planned that Albright would consist of two generating units of 75,000 kilowatts each. Increasing power demands, however, from customers in the West Penn Electric System made the additional third 135,000 kilowatt unit desirable.

During 1951, the foundation work for Units Number One and Number Two were practically completed as were the intake and dam in the Cheat River. Much of the foundation work for Unit Number Three was also completed. Erection of structural steel began at the year's end, and some major equipment were beginning to arrive at the new station's site.

Get Truscale For Accurate Liquid Level Indication Down Where You Can See It

Get This New Catalog of JERGUSON TRUSCALE REMOTE READING GAGES

JERGUSON Truscale Gages are virtually indispensable protection for boilers, storage tanks and processing equipment. A single error in reading liquid level can prove very expensive. Jerguson Truscale Gages forestall errors by bringing the reading down to eye level where your operator can see it and properly protect your equipment.

Amazingly accurate, the Jerguson Truscale Gage records liquid level at remote points with accuracy as close as ½ of 1% of scale reading; has built-in adjustment for easy calibration for any specific gravity or W.S.P.; has standard ranges up to 100"; internal moving parts of stainless steel; visible and audible alarm systems; illuminated dial; scale markings and pointer that glow in the dark; and is available with auxiliary repeaters.

The new Jerguson catalog, profusely illustrated, tells in compact, easy-to-read form how Jerguson Truscale Gages operate . . . and why they are the best and the most dependable for your remote reading needs.

Send now for your copy of the new 8-page Jerguson Truscale Gage catalog. Write today.

JERGUSON

Gages and Valves for the Observation of Liquids and Levels

JERGUSON GAGE & VALVE COMPANY

100 Fellsway, Somerville 45, Mass.

Representatives in Major Cities

Those Listed Under JERGUSON

In Europe: Bailey Meters & Controls, Ltd.

news for the South and Southwest (continued)

Dravo—Atlanta

Appointment of WILLIAM W. TIMMIS, JR., as Southern Sales and Service Manager for DRAVO CORPORATION'S Heating Department has been announced.

William W. Timmis, new Atlanta sales and service manager for Dravo.

Mr. Timmis will supervise the activities of this department in the Southern territory. Headquarters will be located at 800 Peachtree Street, N. E., ATLANTA, GEORGIA. From this location Mr. Timmis will direct the sale of the Dravo "Counterflo" Heater and the Dravo Crane Cab Cooler.

B&W Personnel Changes

J. H. KING, vice president of THE BABCOCK & WILCOX COMPANY, has been named to head the reorganized boiler division of the company and LUKE E. SAWYER and EDWARD A. LIVINGSTONE, president and vice president respectively of the recently absorbed subsidiary Tube Company, have been elected vice presidents of The Babcock & Wilcox Company, according to an announcement made recently by ALFRED IDDLES, president.

The boiler division of the company now comprises what was formerly the marine department, stationary boiler and special products departments and all of these operations are consolidated under Mr. King.

The recent merger of the B&W Tube Company with the B&W Company will not alter the present Tube Co. organization nor in anywise change its operations and resposibilities. It will operate as the Tubular Products Division, with general offices at Beaver Falls, Pa. Sawyer will be in charge of this division.

Peerless Pump Div. Promotes Brisbois

PEERLESS PUMP DIVISION, FOOD MACHINERY AND CHEMICAL CORPORATION, 301 West Avenue 26, Los Angeles 31, Calif., has announced the appointment of ROY F. BRISBOIS as Process Pump Specialist.

Brisbois will devote his time to pump application problems in refineries, chemical process and industrial plants, coordinating his efforts with field engineers and distributors.

Iron Fireman Supplements Southeastern Sales Staff

THE IRON FIREMAN CORP. of Cleveland, Ohio, manufacturers of coal, oil and gas firing equipment for domestic, commercial and industrial heating and power plants, has announced that J. B. KEENER and ANSLEY BRUCE have joined the company's Southern Regional field sales staff.

J. B. Keener of Iron Fireman's Southern Sales staff.

Mr. Keener was named Industrial Supervisor and will specialize in developing new commercial and industrial heating and power applications. His headquarters will be at the Iron Fireman regional office in the Haas-Howell Bldg., Atlanta, Georgia.

Mr. Bruce joined the regional sales staff as District Manager. He is responsible for assisting Iron Fireman franchised dealers in retail sales and service in the states of South Carolina, Georgia, Alabama, Florida, and parts of Tennessee and Virginia.

The Iron Fireman Corporation's Southern Regional office, managed by E. V. CROSSIN, is located at 607 Haas-Howell Bldg., ATLANTA, GEORGIA. HUGH SMITH is field engineer; and J. H. MERRITT, JR., is industrial sales manager.

Chicago Bridge & Iron Co. Appoints Mitchell—Atlanta

CHICAGO BRIDGE & IRON COMPANY, 332 S. Michigan Ave., Chicago 4, Ill., has announced the appointment of MARVIN G. MITCHELL as manager of the company's sales office located at 57 Forsyth St., ATLANTA, GA. Mr. Mitchell will be assisted by J. W. HOERNER and B. S. JENKINS, contracting engineers.

Marvin G. Mitchell Heads Chicago Bridge & Iron, Atlanta Office.

Mr. Mitchell started with Chicago Bridge and Iron Company in 1939. He worked in their drafting rooms, shop and erection department and was transferred to the sales department in 1944. He has sinced worked in BIRMINGHAM, ATLANTA and TULSA offices.

Mr. Mitchell was graduated from Georgia Institute of Technology with a Bachelor of Science degree in Civil Engineering in 1939.

Childers—Houston

At the request of the National Production Authority, R. A. CHILDERS, President, CHILDERS MANUFACTURING COMPANY, HOUSTON, TEXAS, has agreed to serve on the Aluminum Roofing Industry Advisory Committee for term ending August 1, 1952.

The purpose of this Industry Advisory Committee is to deal with industry-wide problems resulting from material shortages and governmental controls which necessarily result from the defense program.

Childers Manufacturing Company, while only 5 years old, is one of the largest fabricators of aluminum in the Southwest. In addition to the production of aluminum roofing and siding, Childers also produces aluminum awnings, canopies and aluminum weather-proof jacketing used for protecting insulated lines, towers, vessels and tanks in power plants and processing plants throughout the country.

The company has just moved into a new 30,000 sq ft factory and office building at 3620 West 11th St., near Hempstead Rd.

Pennsalt—Bryan, Texas

VANCE N. WILSON has been named superintendent of the BRYAN, TEXAS, plant of the PENNSYLVANIA SALT MANUFACTURING CO.

Mr. Wilson assumes production duties formerly carried out by HOWARD L. TEER, Pennsalt's district manager for agricultural chemicals. Before his new assignment, Mr. Wilson was supervisor of personnel administration in Pennsalt's Philadelphia office. Appointment of the new superintendent makes it possible for Mr. Teer to devote all his time to selling activities.

The Bryan plant manufactures calcium arsenate and organic cotton insecticides and serves as a distribution point for other Pennsalt agricultural chemicals.

Cooper-Bessemer—La.

THE COOPER-BESSEMER CORPORATION, Mount Vernon, Ohio, announces the appointment of T. M. LAMBERTH, JR., to its SHREVEPORT, LOUISIANA, office. The assignment as sales and engineering representative will be under the direction of A. K. DEFRANCE, branch manager of the company's office and warehouse facilities in Shreveport.

T. M. Lamberth, Jr., Joins Cooper-Bessemer, Shreveport.

A mechanical engineering graduate from Texas A. & M. Mr. Lamberth has been associated with this engine and compressor builder at Mount Vernon, Ohio. Prior to this service, he was a sales engineer with Joseph A. Coy Company and Arrow Industrial Manufacturing Company, both manufacturers of heat transfer equipment.

Mr. Lamberth's activities will be devoted principally to the engineering application of gas, gas-diesel and diesel engines, as well as compressors and pumps widely used in the transmission of gas and oil in petroleum and chemical processing.

Union Asbestos & Rubber Co. Appoints Perry—Atlanta

UNION ASBESTOS AND RUBBER COMPANY, 332 S. Michigan Ave., Chicago, Ill., announces the appointment of M. H. PERRY as Regional Sales Manager, Fibrous Products Division, with offices at 333 Candler Building, ATLANTA, GEORGIA.

M. H. Perry, Atlanta Regional Sales Manager, Union Asbestos & Rubber Co.

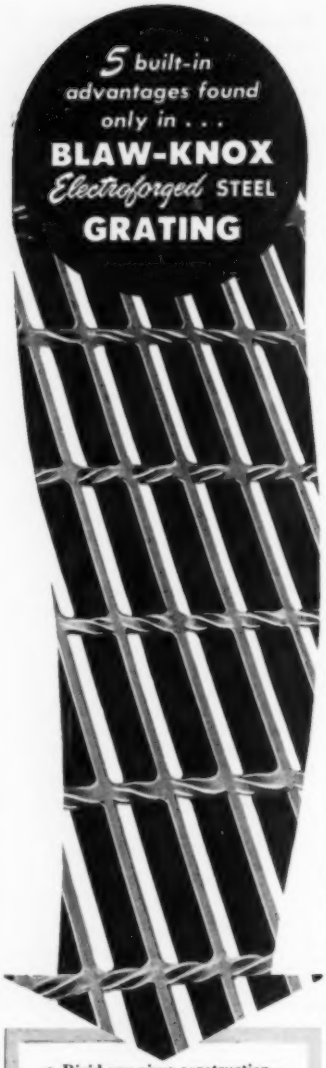
Mr. Perry, who attended Fordham University, has formerly served as sales manager, Steel Precision Products, Brooklyn, N. Y.; president, Perry Steel Co., New York, N. Y.; sales manager, Gasket Materials Corp., Middletown, Conn.; and as New York district manager for Union Asbestos and Rubber Company.

Baker-Raulang—Baltimore

EMORY N. NUMMA, Baker District Representative, with headquarters in Philadelphia, is opening a branch office at 100 S. Gay St., BALTIMORE 2, MARYLAND, with EDWARD G. MATTHEW as manager, according to an announcement by THE BAKER-RAULANG COMPANY, Cleveland.

Edward G. Matthew, Mgr. Baker-Raulang Branch Office, Baltimore.

Before joining the Baker sales organization, Mr. Matthew supervised material handling operations for a large mid-western manufacturer. He is a Purdue University graduate.



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Memphis District Sales Mgr. New York Belting & Packing

NEW YORK BELTING AND PACKING CO., Passaic, N. J., has announced the appointment of WILLIAM I. BUTLER, formerly factory representative in MEMPHIS, TENN., as southeastern district sales manager covering all of the southeastern section of the country from the Mississippi to the Atlantic Coast. He will make his headquarters in Memphis.

Fairbanks, Morse—Atlanta

FAIRBANKS, MORSE & CO., 605 S. Michigan Ave., Chicago 5, Ill., has announced the following changes in its sales organization:

W. B. Wylly, Mgr. Atlanta Branch, Fairbanks-Morse.

W. B. WYLLY, formerly manager of the HOUSTON, TEXAS, Sub-Branch, has been appointed manager of the ATLANTA Branch.

L. A. WEOM, formerly manager of the ST. LOUIS Branch, has been transferred to St. Paul where he has taken over the duties of branch manager succeeding A. C. THOMPSON who has retired after forty-five years of service. CLIFFORD J. SCHROEER, formerly Diesel department manager of the St. Louis Branch, has been promoted to manager of the St. Louis Branch.

B. S. Nelson—Lockett V. P.

A. M. LOCKETT & CO., LTD., NEW ORLEANS, LA., announces the appointment of BERNARD STANLEY NELSON, well-known authority of hydraulics, irrigation, and drainage, as Vice-President in charge of Engineering.

Nelson has been with the Lockett organization since he was graduated from Tulane University as a mechanical and electrical engineer, in 1907. Starting as junior engineer, he served successively as draftsman, design engineer, shop superintendent, and service and test engineer. Later, he was in charge of design, estimating, and supervision of construction of the various types of plants sold by Lockett. In 1919, he was made Chief Engineer, in which capacity he served until the present time.

B. Stanley Nelson, appointed V. P., A. M. Lockett & Co., Ltd., New Orleans.

He is a Life Member of the A.S.M.E. and Louisiana Engineering Society, and a licensed engineer in Texas and Louisiana.

Lunkenheimer—Dallas

A general reorganization of sales territories and executive appointments, aimed at closer coordination of sales activities, has been announced by THE LUNKENHEIMER COMPANY, of Cincinnati, Ohio, manufacturer of valves and engineering devices.

Harold H. Layritz, Sales Mgr., Central Division, The Lunkenheimer Co., with headquarters in Dallas, Texas.

Sales areas include an Eastern Division, a Central Division, and a Western Division. E. R. TIEBERMAN has been named District Manager in the Central Division with headquarters in DALLAS, TEX. HAROLD H. LAYRITZ is Sales Manager.

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Catalogs and Bulletins

(Continued from p. 18)

Free additional information is available to readers of Southern Power & Industry. Check item number on the postage free service coupon post card—page 17.

B-10 **SEALS FOR BEARINGS**—Klosure Catalog 10, 100 pages—Illustrates all types of Klosures (oil and grease seals for bearings), describes typical applications and lists sizes and part numbers. Describes in detail mechanical pressure seals for rotary shafts.—GARLOCK PACKING COMPANY, Palmyra, N. Y.

B-11 **OIL MIST PRECIPITATOR**—Catalog E-50, 4 pages—Illustrates and describes Trion oil mist precipitator, including purpose, principle of operation, construction features, application, special features, and suggested methods of installation.—TRION, INC., 1099 Island Ave., McKees Rocks, Pa.

B-12 **INDUSTRIAL HEATERS** — Folders F-1529 and F-1530, 4 pages each—"Packaged" electric heaters — Chromalox circulation, immersion, etc., types with built-in controls are described and illustrated in industrial applications in folder F-1529. Electric air heaters—Chromalox portable and duct units used in industry are described and illustrated, with typical applications, in folder F-1530.—EDWIN L. WIEGAND CO., 7500 Thomas Blvd., Pittsburgh 8, Pa.

B-13 **FLUE GAS ANALYZER** — Data Sheet 10.15-3a, 4 pages—Describes the Davis indicating and recording flue gas analyzer which utilizes a Davis thermal conductivity gas analyzer in combination with a Brown ElectroniK recorder, to provide continuous recorded combustion analysis. Explains the operation and construction of the apparatus. Includes photographs and schematic diagrams. — MINNEAPOLIS-HONEYWELL REGULATOR CO., Brown Instruments Division, Wayne and Windrim Aves., Philadelphia 44, Pa.

B-14 **PIPELINE PURIFIER** — Condensed Bulletin No. 200, 2 pages—Anderson Hi-eF type Purifiers designed for installation in pipelines as a unit are illustrated and described, including applications, operation, installation, and specifications.—THE V. D. ANDERSON COMPANY, 1935 West 96th St., Cleveland 2, Ohio.

B-15 **V-BELTS** — Bulletin 6830 B — Improved Manhattan single groove V-belts are described, including standardized belt numbers and a list of standard sizes of belts.—RATBESTOS-MANHATTAN, INC., Manhattan Rubber Division, Passaic, N. J.

B-16 **TUBING FAILURES**—Booklet TR 516, 40 pages—Factors affecting tube life in high-pressure, high-temperature applications are presented, including results of investigations of failures of carbon steel, intermediate chromium-molybdenum alloy steel and stainless steel tubing in boilers, cracking stills, heaters, and heat exchangers during service at elevated temperatures and pressures in the power, oil, and chemical processing fields. THE BABCOCK & WILCOX CO., Tubular Products Division, Beaver Falls, Pa.

B-17 **ELECTRICAL AND LUBRICATING PRODUCTS**—Series F.L.B. 300-C, 8 pages—Quick reference folder describes Trico electrical and lubricating products including powder-packed renewable, one-time and plug fuses, fuse pullers, "Kliplok" clamp for fuse clips, "Kliplok" test clamps, and lubricating devices. Wall chart shows types and sizes of lubricating devices with suggestions for selection and application. Illustrated.—TRICO FUSE MFG. CO., 2948 N. 5th St., Milwaukee 12, Wis.

B-18 **CENTRIFUGAL PUMPS** — Booklet 98X7612, 36 pages—Instruction booklet covers installation, operation and repair of single-stage, double-suction centrifugal pumps. Includes inspection and maintenance data. One page is for use as a permanent record of the pump and its performance.—ALLIS-CHALMERS MFG. CO., 954 S. 70th St., Milwaukee, Wis.

B-19 **ELECTRONIC TRANSMISSION AND CONTROL** — Data Release A-702, 6 pages—Explains the Autronic principle and how the Autronic control system utilizes electronics for automatically measuring and controlling process variables such as temperature, pressure, level and flow. Illustrates the components and shows a unit installation. — SWARTWOUT COMPANY, 18511 Euclid Ave., Cleveland 12, Ohio.

B-20 **PACKINGS FOR THE POWER PLANT**—Folder, 6 pages—Features a flow sheet of a rudimentary industrial power plant with each unit keyed to the proper packings and gaskets. Illustrated with photographs. Captions give construction information, sizes, and other pertinent data.—JOHNS-MANVILLE, 22 East 40th St., New York 16, N. Y.

B-21 **FLOW METERS**—Bulletin F1605, 40 pages—Describes instruments for recording, integrating, indicating, automatic controlling, and telemetering the flow of steam, water, air, gas, oil solutions, and other fluids. Both mechanical and electric flow meters are described in a full range of models suitable for industrial plants, utility companies, and process control work.—THE BRISTOL COMPANY, Waterbury 20, Conn.

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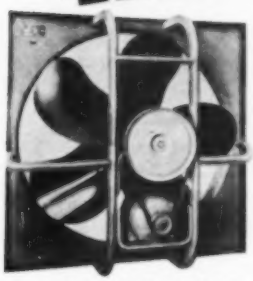

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B-22 **PIPE TOOLS**—1952 Catalog—Gives pertinent information on three pipe and bolt machines: power units, ratchet threaders; reamers, cutters and other pipe tools in the hand and power classification. Contains Operating Guide. Illustrated.—BEAVER PIPE TOOLS, INC., Dana Ave., Warren, Ohio.

B-23 **OSCILLATING CONVEYORS**—Book No. 2444, 24 pages—Describes positive action oscillating conveyors for conveying, feeding, cooling, screening a variety of loose bulk materials. Includes dimensions, weights, and capacity and horsepower charts for heavy duty and lighter duty applications. —LINK-BELT COMPANY, 307 N. Michigan Ave., Chicago 1, Ill.

B-24 **AIR CONDITIONING CABINETS**—Bulletin 3703A, 40 pages—Describes air conditioning cabinets available in both horizontal and vertical models in sizes from 875 cfm to 22,000 cfm. Suggests applications for simple cooling, summer cooling and dehumidifying, winter heating and humidifying, and continuous air cleaning. Discusses design, installation, and maintenance. Capacity tables, diagrams, charts, and detail photographs to aid in selection, are included. —BUFFALO FORGE COMPANY, 490 Broadway, Buffalo, N. Y.

B-25 **HEATING AND AIR CONDITIONING**—Bulletin PB-290, 36 pages—Provides a concise cross section of all the basic equipment required for practically any heating and air conditioning system. Presents descriptions of each line, with cutaway drawings, products and parts photographs, construction features, and tables of capacities, sizes, and dimensions.— THE TRANE COMPANY, La Crosse, Wisconsin.

B-26 **HEAT INSULATION** — Booklet, 8 pages—Contains new data on use of hydrous calcium silicate insulation; illustrated with graphs, tables and drawings showing numerous applications in projects for temperatures as high as 1200 F. Lists available shapes and sizes. Discusses physical characteristics, recommended thicknesses, efficiencies, and other application facts.— KATLO DIVISION, OWENS - ILLINOIS GLASS COMPANY, Toledo 1, Ohio.

B-27 **EXPANSION JOINTS** — Catalog CMH-127, 16 pages—Describes various types of corrugated expansion joints, gives specification and installation data for joints for low pressure applications; controlled-flexing joints, and joints for extremely high pressure applications. Covers dual, hinged, balanced, and bulkhead units. —FLEXONICS CORPORATION, 1332 South Third Ave., Maywood, Ill.

B-28 **COMBUSTION EQUIPMENT** — Bulletin B-11, 28 pages—Discusses design, installation, maintenance, and operation of industrial burners. Lists seven different types of burners and related parts. Includes tables of specifications and equipment photographs and drawings.—C. M. KEMP MFG. CO., 405 East Oliver St., Baltimore 2, Md.

B-29 **POWER PLANT COAL HANDLING** —Book No. 2410, 44 pages—Covers coal and ash handling equipment for power plants, with helpful layout drawings, and photographs of actual installations. Discusses unloading coal, auxiliary unloading, coal storage and reclaiming, crushers, transporting and distributing equipment, and water intake screens. — LINK-BELT COMPANY, 307 N. Michigan Ave., Chicago 1, Ill.

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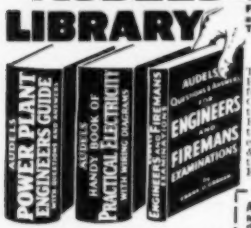

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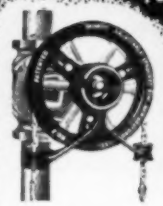

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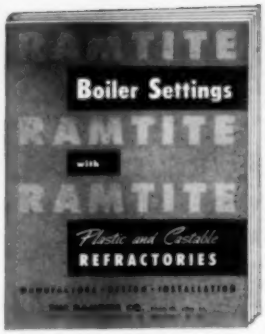

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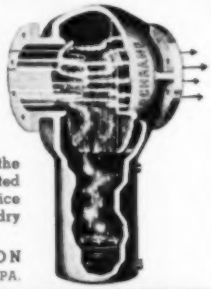

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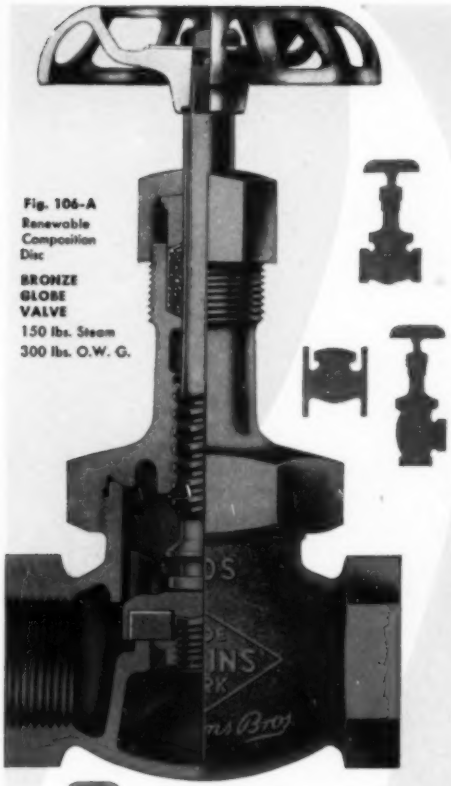

Fig. 106-A
Renewable Composition Disc

BRONZE GLOBE VALVE
150 lbs. Steam
300 lbs. O.W. G.

JENKINS FIG. 106-A "FAMILY"

Start with the standard Fig. 106-A. Trimming is interchangeable in Globe or Angle body, screwed or flanged.

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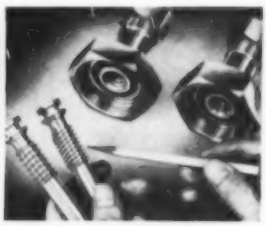

For Quick Opening and Closing — Merely substitute the bonnet and spindle from Fig. 941, in which threads are pitched more sharply.

For Lift Check Service — Globe or Angle Bodies can be fitted with interchangeable Cap, Disc Holder, and Guide Disc Nut from Fig. 117A. Addition of spring from Fig. 655A provides spring loaded service.

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Look over these pictures and see how easy it is to make up just the valve type you need, simply by interchanging parts. Think of the saving this means in maintenance expense . . . in reduced inventory of spare valves in your stockroom.

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SINCE 1864

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